一=155円を採用した。建設方法は請負方式とした。

ファースト・ステイジ・プロジェクトの総建設費は27,500百万ガラニーでそのうち外貨分は13,100百万ガラニー、内貨分は14,100百万ガラニーである。その内訳は表8－11に、各年の工事費支出計画は8－12に示す。

8.6.2 維持管理費

維持管理費は人件費、機械運転費、車輌費、及びその他の雑費から成る。建設される施設の全耐用期間中に必要な維持管理費としては毎年83.0百万ガラニーをみこむものとする。

8.7 プロジェクト評価

ここではマスター・プランと同様の考え方で経済面、財政面からファースト・ステイジ・プロジェクトの妥当性を検討する。

8.7.1 経済評価

プロジェクト便益

ファースト・ステイジ・プロジェクトの便益は基本的にはマスタープランと同様プロジェクト実施前と後の洪水被害の差でもとめる。このためムブリカオ、イタイ川各流域のプロジェクト実施前後の洪水被害を金銭的に評価する。

この2つの流域の交通停止、家屋浸水による直接被害は以下にのべる箇所で発生している。

(1) ムブリカオ川流域

ムブリカオ川流域での洪水被害は次の2つのタイプに分けられる。

① 流域内に張りめぐらされた道路網上の浸水

② 流下能力の乏しい区間での河川沿いの浸水

また、当流域に於ける洪水期間は比較的短いものの、集水面積が小さい場合でも道路上の各地点に頻繁に発生し、近傍の河川に流下する。

洪水による交通渋滞は主に幹線道路であるアルティガス、ヘネラリシモ・フラ

ンコ、マリスカル・ロペス、エウセビオ・アジャラ、モンセニョール・ボガリン、サクラメント通りやいくつかの街路で発生している。図8－18はこれらの地点及び時間平均交通量を示す。

これら幹線道路のうち特に被害の深刻なのは、洪水による停滞時間、交通量からみて、ヘネラリシモ・フランコ、マリスカル・ロペス、エウセビオ・アジャラ通りが上げられる。

また、河川沿いの浸水は主に次の地点で発生している。

－　ムブリカオ川とエスパーニャ通りの延長であるヘネラリシモ・フランコ通りが交差する橋梁地点上流域

－　ムブリカオ川に鉄道橋が架かる地点の上、下流域

(2)　イタイ川流域

当流域での洪水形態は流出量に比べ流下能力が乏しく、またアビアドーレス・デル・チャコ通り上流近辺にみられるように緩勾配であるところからほとんどの河川又は排水路沿いに巾広く拡がっている。しかしムブリカオ川流域にみられるような道路上の湛水地点はそれ程多くない。ただ交通停止による洪水被害はムブリカオ川流域に比べ少ないものの湛水時間が長いためかなりの被害額に達している。この交通停滞は主にマダム・リンチ、アビアドーレス・デル・チャコ、マリスカル・ロペス、エウセビオ・アジャラ通り幹線道路といくつかの街路で発生している。（図8－18参照）

これらの幹線道路のうち特に被害が深刻なのはマダム・リンチ、マリスカル・ロペス、エウセビオ・アジャラ、ボジャニ通りである。

また、浸水が頻繁に生じているおもな地域は以下の通りである。

－　アエロプエルト住宅団地

－　ボジャニ通りとアジャラ通りの交差点付近

－　マダム・リンチ沿いの地域

マスター・プランと同様の考えで求めたムブリカオ、イタイ川流域のファースト・ステイジ・プロジェクト実施による年平均便益はそれぞれ 599百万ガラニー、1,509百万ガラニーである。

内部収益率

ファースト・ステイジ・プロジェクトの評価は内部収益率によって判断する。表8－13に示す費用、便益関係からムブリカオ、イタイ川各流域のＩＲＲは以下の通りである。

ムブリカオ川流域	11.2	%
イタイ川流域	11.8	%
ファースト・ステイジ・プロジェクト	11.6	%

本プロジェクトのような社会基盤整備事業の場合通常内部収益率が低くても実施されており、ＩＲＲ11.6%を示す当プロジェクトの実施は充分妥当なものと考えられる。

8.7.2　実施計画財務検討

プロジェクト実施に必要な外貨分の借り入れ条件を利子率 3.5%、10年間の返済猶予期間を含む返済期間を30年とした場合、建設期間、債務返済期間の全支出は内貨分を含め36,907百万ガラニー、また年平均支出は 1,025百万ガラニーとなる。また返済猶予期間中の維持管理費は42,264百万ガラニーとなる。これに対し最も確実な資金源は7.7.2節で述べたようにコルポサナの雨水排水部門からの収入であり、この収入からプロジェクトの返済に割り振り可能な額は年平均で2,387百万ガラニーと考えられる。（表７－９参照）

表 8－14に示すようにこの返済額と支払い可能額の比較では後者が前者を総額で 43,666百万ガラニー、年平均で 1,213百万ガラニー上廻っているところからファースト・ステイジ・プロジェクトの遂行は財政的に問題ないと考えられる。

8.7.3　社会経済的影響

計量可能な被害額に基づく直接便益に加え、ムブリカオ、イタイ両流域の雨水排水施設整備計画の実施により以下に示すような好影響が考えられる。

(1)　この国の首都アスンシオン市と主要都市を結ぶ幹線道路の交通停滞がなくなることから生活必需品の流通、人々の通行が確保される。

この主要幹線道路とその役割はつぎの通りである。

- アルティガス通り　；国道９号と合流して、マリアノ・アロンソを通り、ポソ・コロラド各市に通ずる。
- エスパーニャ通り　；国際空港、ルケ市を通り、アレグァ市に通ずる。
- マリスカル・ロペス通り　；サン・ロレンソ市で国道１号と合流しストロエスネル市に通じる。
- エウセビオ・アジャラ通り；マリスカル・ロペス通りと同様、サン・ロレンソ市で国道１号、２号と合流する。
- マダム・リンチ通り　；上記の道路を結ぶ環状道路

(2) 雨水の速やか、かつ安全な排水によって現在家屋浸水被害を被っている区域や、道路浸水で影響を受ける地域の生活水準が向上することになる。

イタイ、ムブリカオ川流域での常習的な浸水地帯は次の通りである。

- アルティガス通りがムブリカオ川を横切る橋の上流
- ヘネラリシモ・フランコ通りがムブリカオ川を横切る橋の上流
- マダムリンチ沿いの住宅地、特にアエロプエルト地区の住宅地
- ボジャニ通りとエウセビオ・アジャラ通り沿いの交差点近傍

第9章　雨水排水施設整備に必要な組織制度

9.1　概　要

第3章 3.3に述べたように洪水防御，水資源開発を管轄する当国の政府組織は明確でなく、現在河川、森林、土地等自然資源を総合的に管理、開発するための法制度について検討を行われているもののまだ施行されるまでに至っていない。

ここで雨水排水問題に限っていえばコルポサナが法律405号、条例29697でその管理責任を委ねられており、努力を重ねているが、問題点も多い。

本章では、現行の雨水排水システムについて問題の指摘を行いさらに必要な組織・制度について検討する。

9.2　雨水排水システムに関わる問題

雨水排水システムに関わる問題の原因は、コルポサナ自身によるものもあるがコルポサナと関連機関との調整不充分によるところが大きい。

関連機関との調整不充分による問題

調査対象流域内では、コルサポナとの調整を行なわずに遂行されている計画があり、既存施設の機能低下、破壊、洪水被害の増大等が発生しているが、これは以下の様に整理される。

(1)　現状における問題

－　道路建設により排水路が埋め立てられている。

－　コルポサナ以外の他機関により独自の目的を持つ他流域への影響を無視した排水施設が設置されている。

－　洪水氾濫源で都市開発が行われ、また河川敷が侵犯されている。

(2)　将来における問題

－　将来的には都市開発が進み、浸透域の減少により流出量が増大するが、これに対応するため、当雨水排水システムは公共用地貯留、あるいは浸透施設等の流出抑制施設を含んでおり、この設置に関しては関係機関の理解と協力が不可欠である。

管轄機関の責任による問題

管轄機関の責任から生じている洪水被害増加問題点としては、以下のものが挙げられる。

(1) 現状における問題

- 雨水排水システムとして管理している排水路の延長、範囲が明確でないため排水路内に排水以外の目的をもった施設が設置されている。
- 排水路の維持管理に関して排水路にゴミが捨てられたまま放置されており、また洪水で損傷した排水施設が修理されずにある。
- 洪水被害を出来るだけ少なくするため洪水時には情報を収集し、適切な緊急対策をたてる必要があるが現在のところ実施されていない。

(2) 将来における問題

- 将来問題としては、家屋あるいはその他の構造物が現況河川近くに建設されているため、流出増に対応する河川の拡幅が困難になる。

9.3 必要組織

前述の状況から雨水排水問題に対処するための必要組織として基本的には調整機関、管轄機関の2つがあげられる。

9.3.1 調整機関

雨水排水についての各機関の間で調整を必要とする問題としては大まかに、多数の関連機関で討議すべき広範囲に影響する課題と、少数の機関で対処できる通常一般課題とに分けられる。

このことから調整機関も次の2種類設置するのが望ましい。

(1) 広範囲影響課題を討議する全体委員会。

全体委員会では都市計画、大規模道路計画等多くの関係機関が関わる重要課題について調整をおこなう。委員会の構成は雨水排水問題に関わる市役所、公共事業省、内務省、セナサ等の代表者とするが、このような大きな問題が発生することはまれ

であるのでこの委員会は構成委員の要請により会を開催する。組織として総務部、技術部、財務部、法律部等からなる事務局を置く。

(2) 個別委員会

個別委員会は平常頻繁に生じる雨水排水に関わる問題について調整を行う。構成委員はこういった平常発生する問題に精通している人間とし、また委員会の運営を専門に行う主担当者を置く。会の開催は情報交換のため少なくとも1ヶ月1回とし、また必要に応じ開催する。組織としては、全体委員会と同様の部からなる事務局を置く。

9.3.2 管轄機関

先述のように雨水排水を管轄するのはコルポサナであるがこの管轄機関が果たす役割は ①システム整備計画立案 ②工事実施、維持管理 ③洪水防御対策、災害復旧 ④資金準備等である。

この関連から管轄機関が機能を充分に果たすため設置すべきおもな部門は ①総務部 ②計画部 ③洪水防御対策部 ④工事維持管理、災害復旧部 ⑤資金調達部 ⑥法制度部等である。

9.4 必要法制度

組織の機能を明確にするためには法律の整備が必要であり、ここで先述の各機関および関連する機関で整備される法律の中に織り込むべき項目をまとめると以下のようである。

調整機関

調整機関設置のための法案に織り込まれるべき内容は ①機関設置の目的 ②機関の構成 ③機能、責任および権限 ④機関の政府のなかでの位置付け ⑤機関の会議招集等である。

管轄機関

管轄機関が備えるべき項目は　①管理の範囲　②計画立案の機能　③計画実施の機能　④施設維持管理の機能　⑤緊急洪水防御対策の実施　⑥災害復旧工事　⑦許認可の権限および禁止　⑧資金調達の権限等である。

関連機関

関連機関については以下の項目を織り込む必要がある。

(1) 都市開発に対する義務

都市開発は基本的に流出量の増大を招くことから都市開発当事者に対し洪水流出量増大に対処する施設を雨水排水担当機関の監督のもとに設置を義務づける。

(2) 家屋・ビル建設に対する義務

都市開発同様不浸透域の減少による浸透能、流出抑制能を悪化させる家屋・ビル建設に際し流出量増大に対処する流出抑制施設設置を義務づける。

(3) 公共用地の利用

公共用地利用に対し、本来の目的利用の他、雨水貯留施設としての併用利用を可能にする。

(4) ゴミの不法投棄に対する監視

排水路の流下能力減少の大きな原因であるゴミの不法投棄に対する取締まりを強化する。

9.5 行動計画

雨水排水システムを整備していくためには組織、法律、政令、規則の整備とともに具体的な行動を起こす必要がある。ここで第1段階計画として排水計画実施をよりスムーズに実現していくための行動計画を 表9－1の様に長期と短期の2種類に分けて取りまとめた。

第10章　提　　言

1. 河道改修と排水施設及び流出抑制施設の設置からなる雨水排水プロジェクトのベイシック・プランが長期的な観点に立ち10年確率規模で策定された。又、マスター・プランが2005年を目標年度とし、3年確率で策定され、経済的にも妥当であることが立証された。このマスター・プランの枠組み内で3年確率規模に基づいたファースト・ステイジ・プロジェクトを策定した。この結果ファースト・ステイジ・プロジェクトはＩＲＲが11.6%を示し、経済的に妥当である。又、技術的、財政的にも実行可能であることが立証された。本プロジェクトの実施により計画対象地域だけでなくパラグアイ国全体において社会福祉の向上と経済活動の安定が図られ、アスンシオン首都圏の開発が促進される。従って、プロジェクトの早期実現にむけて体制を整えていくことが望ましい。

2. プロジェクト実施に関連して、雨水排水システムに関係する各機関の問題調整のため本調査期間においてコルポサナを中心に市役所、セナサ、ＭＯＰＣ等によって構成されたコーディネーティング・グループが暫定的に設置され、種々の問題について議論がなされた。今後ともこのコーディネーティング・グループの会議を継続的に行い、本調査の行動計画を参考に雨水排水システムの整備に必要な組織および制度を確立していくことが望ましい。

3. 雨水排水施設は機能を確実にするために平時の維持管理が主要であるが、これについて維持管理体制を強化するとともに、住民が不法にゴミを投棄したり、水路を埋め立てたりしないよう指導していく必要がある。

4. 流出抑制施設は他の雨水排水施設と比較して地域別に小規模に設置できるものである。特に、流出抑制施設の１つである貯留浸透施設は住民の協力により、各民家に簡単に設置できるものである。従って、関係官庁は将来の流域発展に伴う流量増に対処するため各住民に雨水調節の役割を分担するように勧めるとともに、適当な法律や法令の制定を検討していくべきである。

5. 土地開発、ビル建設、高速道路建設等の大規模プロジェクトは確実にそれらの地域の流出量を増加させる。従って、これらの大規模プロジェクトが実施される場合は、建設業者や開発業者に雨水排水施設やシステムの設置を義務づけるための法整備をするのが望ましい。

6. 雨水排水プロジェクトの実施で問題となるのは用地買収、家屋移転であるが、現在河川沿いの地域は急速に開発されているところから、コルポサナの河川管理区域の設定、河川改修のための用地確保を早急に進める必要がある。また長期的視点に立ち、ベーシック・プランで示された河川用地を確保していくことは将来の河川事業に於いて非常に重要なことである。

7. 当流域の今後の雨水排水システム整備に対し、住民協力の必要性はさらに高まるとと考えられるが、このためには住民に雨水排水システムの役割を充分認識してもらうことが必要である。この意味から、本調査期間中にコルポサナと気象庁に浸透実験のために設定した浸透施設は住民の理解を深める意味から出来るだけ多い機会に紹介するのが望ましい。

8. 降雨量、地形図、河道の測量結果等の基本的な資料および情報は調査に不可決であるが、現在のところ質・量共に不足している。従って、今後ともこういった基礎資料の整備を行ない、今後のプロジェクトの実施のために役立てることが必要である。特に本調査期間中に設置された水位、雨量計は充分な維持管理のもとに観測を継続していくことが望ましい。

TABLES

表1－1　監理委員及び調査団員の構成

Name	Designation
ADVISORY COMMITTEE	
Dr. Katsuyoshi Ishizaki	Chairman of the Committee
Mr. Eiichi Nakamura	Member (Urban Planning/Drainage Planning)
Mr. Katsuhide Yoshikawa	Member (Hydrology/Hydraulics)
Mr. Noboru Yamaguchi	Member (Facility Planning)
Mr. Tohru Take	Member (Coordination)
STUDY TEAM	
Mr. Katsuhisa Abe	Team Leader
Mr. Yoshiyuki Tomioka	Assistant Team Leader (River Planning Engineer)
Mr. Yoshiharu Matsumoto	Hydrologist
Mr. Iwao Irie	Geologist
Mr. Motonori Yoshii	Drainage Planning Engineer
Mr. Junji Kamata	Flood Analyst
Mr. Hiroaki Sakamoto	Urban Planner
Mr. Akio Shichijugari	Drainage Structural Engineer
Mr. Iwao Chikaraishi	Structural Engineer/Cost Estimator
Mr. Teru Sasaki	Institutional Expert
Mr. Kimio Shimomura	Project Economist
Mr. Shinichi Kono	Surveying Engineer

表２－１　第２次５ヶ年計画（1977－1981）に於ける国内総生産

Year	Current Price ($G10^6$)	1982's Constant Price ($G10^6$)	Growth Rate (%)
1977	263,612	495,493	10.9
1978	322,542	551,732	11.4
1979	430,514	614,392	11.4
1980	560,459	684,686	11.4
1981	708,689	744,361	8.7

Source:　Central Bank of Paraguay

表２－２　第３次５ヶ年計画（1985－1989）に於ける予想国内総生産

Year	1982's Constant Price ($G10^6$)	Growth Rate (%)
1985	772,445	5.0
1986	818,792	6.0
1987	872,013	6.5
1988	928,694	6.5
1989	989,059	6.5

Source:　Technical Planning Secretariat

表2－3　全国及びアスンシオン首都圏での人口増加

Location	1950		1962		1972		1982		Average Annual Growth Rate (%)		
	Population (Persons)	Rate (%)	Population (Persons)	Rate (%)	Population (Persons)	Rate (%)	Population (Persons)	Rate (%)	1950-62	1962-72	1972-82
1. Asuncion	26,634	76.0	288,882	70.6	388,958	67.2	457,210	57.2	2.83	3.10	1.63
2. F. de la Mora	5,253	2.0	14,519	3.5	36,892	6.4	66,450	8.3	8.84	10.04	6.06
3. Lambare	-	-	20,778	5.1	31,732	5.5	67,180	8.4	-	4.44	7.79
4. Limpio	8,473	3.1	10,126	2.5	12,767	2.2	16,650	2.1	1.50	2.41	2.69
5. Luque	22,361	8.2	30,834	7.5	40,677	7.0	63,210	7.9	2.71	2.88	4.51
6. M. R. Alonso	4,043	1.5	5,686	1.4	7,388	1.3	14,520	1.8	2.88	2.72	6.99
7. Nemby	4,974	1.8	5,984	1.5	6,899	1.2	12,310	1.5	1.55	1.47	5.96
8. San Antonio	4,698	1.7	5,965	1.5	7,321	1.3	8,110	1.0	2.01	2.12	1.03
9. San Lorenzo	13,100	4.8	18,573	4.5	36,811	6.3	74,240	9.3	2.95	7.27	7.27
10. Villa Elisa	2,365	0.9	3,214	0.8	4,774	0.8	11,600	1.5	2.59	4.14	9.28
11. Villa Hayes	-	-	4,712	1.1	4,795	0.8	7,660	1.0	-	0.18	4.80
Metropolitan Area (Total)	271,901	100.0	409,273	100.0	579,014	100.0	799,140	100.0	3.47	3.62	3.27
Paraguay	1,328,452		1,819,103		2,357,955		3,035,360		2.65	2.70	2.56

Source: Censo Nacional de Poblacion y Viviendas 1982

表２－４　分野別国内総生産
(1982年価格)

(Unit: Billion Guaranies)

Economic Sector	1979	1980	1981	1982	1983
Agriculture	90.4	99.3	113.9	114.7	111.4
	14.7%	14.5%	15.3%	15.6%	15.6%
Livestock	51.7	53.8	55.4	56.5	55.5
	8.4%	7.9%	7.4%	7.7%	7.8%
Forestry	15.9	18.4	19.5	18.4	18.0
	2.6%	2.7%	2.6%	2.5%	2.5%
Hunting and Fishing	0.9	1.0	1.1	1.1	1.0
	0.1%	0.1%	0.2%	0.1%	0.2%
Mining	2.1	2.7	3.1	3.1	2.9
	0.3%	0.3%	0.4%	0.4%	0.4%
Manufacturing	106.3	120.4	125.6	121.0	115.9
	17.3%	17.6%	16.8%	16.4%	16.2%
Construction	35.8	45.2	52.7	49.5	46.7
	5.9%	6.6%	7.1%	6.7%	6.5%
Electricity	10.1	12.1	12.6	15.8	15.0
	1.6%	1.8%	1.7%	2.2%	2.1%
Water and Sanitary Services	1.7	1.9	2.1	2.3	2.8
	0.3%	0.3%	0.3%	0.3%	0.4%
Transportation and Communications	26.4	29.6	30.5	31.1	30.7
	4.4%	4.3%	4.1%	4.2%	4.3%
Commerce and Finance	167.4	185.0	200.6	196.2	190.2
	27.3%	27.0%	27.0%	26.6%	26.6%
General Government	24.0	25.7	31.6	32.9	32.2
	3.9%	3.8%	4.2%	4.5%	4.5%
Housing	19.7	21.5	23.0	22.5	21.4
	3.2%	3.1%	3.1%	3.0%	3.0%
Other Services	61.2	68.1	72.7	72.0	71.1
	10.0%	10.0%	9.8%	9.8%	9.9%
Total	613.8	684.7	744.4	737.1	714.8
	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Central Bank of Paraguay

表2－5 分野別就業人口
(1982)

Economic Sector	Population (person)	Distribution (%)
Agriculture	429,230	41.7
Livestock	14,230	1.4
Forestry, Fishing, Etc.	2,260	0.2
Mining	1,130	0.1
Industrial Manufacturing	124,840	12.1
Construction	67,170	6.5
Electricity, Water/Sewage	2,540	0.2
Transportation/Communications	26,230	2.5
Commerce	78,650	7.6
Hotels and Restaurants	6,560	0.6
Housing and Finance	17,120	1.7
Other Services	168,980	16.4
Others	90,740	8.8
Total	1,029,680	100.0

Source: General Direction of Statistics and Census

表2－6　アスンシオン市関連開発計画

Item		Particulars	Stage	Undertaken By	Financial Source
Road Network	(1)	Improvement of Eusebio Ayala Ave., including Parking Lot (PRODEMA)	Planning Stage	Municipal Government	Not decided
	(2)	Improvement of Fernando de la Mora Ave.	-ditto-	-ditto-	-ditto-
	(3)	Widening of Road and Improvement of Drainage Along Avenue Madame Lynch Avenue	Under construction	-ditto-	Municipal Budget (for 1985)
	(4)	Improvement of Santa Teresa Avenue and Aviadores del Chaco Ave.	-ditto-	-ditto-	Municipal Government
Land Use	(1)	Urban Waste Disposal Facility (PRODEMA)	Planning Stage	-ditto-	-ditto-
	(2)	Construction of New Municipal Building	Under construction	-ditto-	-ditto-
	(3)	Improvement of Recreation Area (Plaza Palacio de Justicia)	Under construction	Private enterprise	
	(4)	Road Improvement for Pedestrians' Exclusive Use of Palma Street and Estrella Street (PRODEMA)	Planning Stage	Municipal Government	Municipal Government
	(5)	Rehabilitation of Slum Area Along Paraguay River	-ditto-	-ditto-	Not decided
	(6)	Construction of New Cemetery	-ditto-	-ditto-	-ditto-
	(7)	Expansion of Green Space Near Palacio de Govierno	-ditto-	-ditto-	-ditto-

表3－1　調査対象域内の河川概要

Basin Number	Name of Basin	River Length (km)	Longitudinal /1 Gradient	Catchment Area (ha)	Subbasin Number	Existing Flow Capacity (m^3/s)	Flow Capacity Per Catchment Area ($m^3/s/km^2$)	Remarks
Basins With River Channels								
Group I								
B-4	Jaen	1.90	1/79	247	-	30	12	
B-6	Salamanca	1.83	1/46	143	-	15	13	
B-7	Zanja Moroti	2.35	1/43	161	1	60	85	
					2	90	76	
B-8	Ferreira	3.34	1/68	400	1	170	59	
					2	190	48	
B-19	Lambare	7.03	1/107	2,566	1	10	3	
					2	15	6	
					3	150	11	
					4	35	2	
					7	150	6	
					5	210	43	
					6	200	28	
B-21	Villa Elisa	5.20	1/68	1,153	1	20	7	
					3	75	7	
B-22	Nemby	7.55	1/101	4,417	1	85	15	
					2	20	2	
					3	25	2	
					4	260	28	
					5	25	1	
Group II								
B-2	Jardin	0.78	1/46	60	-	30	50	
B-10	Las Mercedes	1.35	1/45	212	-	20	9	
B-12	Bella Vista	0.86	1/34	75	-	30	40	
B-14	Mburicao	11.04	1/100	1,645	1	20	5	
					2	35	6	
					4	130	11	
					6	120	7	
					3	30	8	
					5	20	9	
B-15	Ycua Carrillo	3.00	1/78	401	1	20	11	
					2	30	7	
B-16	Santa Rosa	2.40	1/87	313	-	20	6	
B-17	Tres Puentes Cue	5.99	1/171	680	-	10	1.5	
B-18	Itay	25.50	1/318	13,613	3-1	3	0.9	
					5	5	0.7	
					2-2	15	1.3	
					6	60	1.4	
					3-2	3	0.9	
					4	5	1.2	
					1	30	2.2	
					2-1	15	0.9	
					7-2	10	2.1	
					7-1	5	0.4	
					7-3	5	1.8	
					8	23	1.2	
					9	-	-	
					10	20	0.5	
B-26	Zeballos Cue	1.23	1/68	213	-	10	5	
B-27	Paso Cai	4.00	1/129	549	-	10	2	
Group III								
B-23	San Lorenzo	9.60	1/142	3,369	1	5	0.3	
					2-1	5	0.2	
					2-3	10	0.3	
					2-2	10	1.3	
B-24	Tayazuape	8.80	1/163	3,013	1	55	4	
					3	15	0.5	
					2	25	5	
B-25	Ycua Dure	4.50	1/113	1,257	-	42	3	
Basins Without River Channels								
B-1	Varadero	-	-	325	-	-	-	No river
B-3	Centro	-	-	724	-	-	-	-do-
B-5	Tacumbu	-	-	170	-	-	-	-do-
B-9	Villa Universitaria	-	-	240	-	-	-	-do-
B-11	Mariscal Lopez	-	-	66	-	-	-	-do-
B-13	Tablada	-	-	103	-	-	-	-do-
B-20	Valle Apua	-	-	1,063	-	-	-	-do-
B-28	Mariano Alonso	-	-	1,565	-	-	-	-do-
B-29	Villa Hayes	-	-	895	-	-	-	-do-
B-30	Petropar	-	-	523	-	-	-	-do-
B-31	Achucarro	-	-	1,335	-	-	-	-do-

Note: /1 Longitudinal gradient is the ratio of the height difference between beginning and end points and the total river length.

表3－2　1982年発生既往最大洪水時の流域別洪水被害

Name of Basin	Catchment Area (ha)	Inundated Area (ha)	Inundated Houses (houses)	Inundated Trunk Roads (points)	Inundated Street Junctions (points)	Affected Vehicles At Trunk Roads (10^3 units)
Varadero	325	2.1	8	-	13	-
Jardin	60	0.2	-	-	3	-
Jaen	247	1.4	8	-	8	-
Salamanca	143	2.7	31	-	1	-
Zanja Moroti	161	1.3	11	-	5	-
Ferreira	400	4.3	18	1	17	1
Las Mercedes	212	1.0	-	2(1)	2	3
Mariscal Lopez	66	0.7	-	-	5	-
Bella Vista	75	2.0	14	1	6	1.3
Tablada	103	1.0	6	1	5	1
Mburicao	1,645	46.6	100	8(4)	67	28
Ycua Carrillo	401	1.6	22	-	2	-
Santa Rosa	313	2.7	44	1(1)	8	2.5
Itay	5,455 /1	283.9	1,800	13(6)	243	17
Lambare	2,566	39.9	189	6(3)	69	8

Note:

/1 Excluding the area downstream of Aviadores del Chaco Avenue.
( ) Number of spots on habitually inundated trunk roads.

表３－３　流域別洪水被害比較

Name of Basin	Inundated Area	Inundated Houses	Influence To Traffic	Flood Frequency and Duration	Evaluation
Varadero	*	*	*	*	*
Jardin	*	*	*	*	*
Jaen	*	*	*	*	*
Salamanca	*	**	*	*	**
Zanja Moroti	*	**	*	*	*
Ferreira	*	**	*	**	**
Las Mercedes	*	*	*	*	*
Mariscal Lopez	*	*	*	*	*
Bella Vista	*	**	*	*	*
Tablada	*	*	*	**	**
Mburicao	**	***	****	****	****
Ycua Carrillo	*	**	*	*	*
Santa Rosa	*	**	*	**	**
Itay	****	****	****	****	****
Lambare	**	***	**	***	***

Note:　* Less Serious　　*** Very Serious
　　** Serious　　**** Extremely Serious

表３－４　1982年発生既往最大洪水時の幹線道路被害

Name of Road	Number of Spots on Inundated Trunk Road	Affected Vehicles At Trunk Roads (10^3 units)
Artigas Avenue	3	5
Espana Avenue	3	10
Mariscal Lopez Avenue	5	22
Eusebio Ayala Avenue	4	28
Fernando de la Mora Avenue	2	5
Feneral Maximo Santos Avenue	3	2
Madame Lynch Avenue	6	17

表５－１　2005年時の土地利用状況

(Unit: ha)

Basin Number	Name of Basin	Commer-cial	Residential				Indus-trial	Public	Recrea-tional	Farmland	Grand Total
			High	Medium	Low	Total					
B-1	Varadero	19	199	54	-	253	4	35	14	-	325
B-2	Jardin	-	51	-	-	51	7	2	-	-	60
B-3	Centro	380	108	96	-	204	108	32	-	-	724
B-4	Jaen	49	27	159	-	186	5	7		-	247
B-5	Tacumbu	-	-	112	-	112	55	3	-	-	170
B-6	Salamanca	10	-	105	-	105	-	10	18	-	143
B-7	Zanja Moroti	6	-	151	-	151	-	3	1	-	161
B-8	Ferreira	56	-	330	-	330	-	10	4	-	400
B-9	V. Universitaria	3	-	198	-	198	8	28	3	-	240
B-10	Las Mercedes	19	-	166	-	166	-	16	11	-	212
B-11	Mariscal Lopez	3	-	56	-	56	6	1	-	-	66
B-12	Bella Vista	5	-	64	-	64	5	1	-	-	75
B-13	Tablada	7	-	86	-	86	7	1	2	-	103
B-14	Mburicao	175	27	864	287	1,178	26	209	52	5	1,645
B-15	Ycua Carrillo	20	-	341	-	341	14	11	15	-	401
B-16	Santa Rosa	5	97	119	-	216	1	7	76	8	313
B-17	Tres Puentes Cue	61	144	19	-	163	-	188	230	38	680
B-18	Itay	568	367	1,421	2,984	4,772	66	922	150	7,135	13,613
B-19	Lambare	322	523	1,614	-	2,137	33	37	37	-	2,566
B-20	Valle Apua	17	-	325	615	940	7	4	95	-	1,063
B-21	Villa Elisa	36	-	262	827	1,089	23	3	2	-	1,153
B-22	Nemby	106	-	204	1,046	1,250	23	17	33	2,988	4,417
B-23	San Lorenzo	148	-	131	1,456	1,587	14	256	119	1,245	3,369
B-24	Tayazuape	76	-	11	602	613	-	7	5	2,312	3,013
B-25	Ycua Dure	16	-	-	446	446	2	4	3	786	1,257
B-26	Zeballos Cue	14	-	-	102	102	1	80	-	16	213
B-27	Paso Cai	35	-	277	61	338	-	36	2	138	549
B-28	Mariano Alonso	28	-	-	321	321	5	5	2	1,204	1,565
B-29	Villa Hayes	47	-	-	267	267	93	30	10	448	895
B-30	Petropar	-	-	14	167	181	10	-	2	330	523
B-31	Achucarro	19	-	-	535	535	37	4	5	735	1,335

NOTE : "Residential" is classified into high, medium and low densities.

表5－2　建蔽率

Classification	Unit	Roof	Interspace		Roads	Total	Building-to-Land Ratio
			Hard/1	Soft/2			
Commercial	ha	13.6	3.2	1.8	6.4	25.0	
	%	54.4	12.8	7.2	25.6	100.0	73.0
High Density Residential	ha	9.1	5.3	4.1	6.5	25.0	
	%	36.4	21.2	16.4	26.0	100.0	49.1
Medium Density Residential	ha	4.8	6.7	7.5	6.0	25.0	
	%	19.2	26.8	30.0	24.0	100.0	25.1
Low Density Residential	ha	2.8	1.6	14.9	5.7	25.0	
	%	11.2	6.4	59.6	22.8	100.0	14.4
Industrial	ha	9.8	9.0	36.0	9.9	64.7	
	%	15.1	13.9	55.7	15.3	100.0	17.9
Public (Hospitals)	ha	6.6	4.3	80.4	-	91.3	
	%	7.2	4.7	88.1	-	100.0	7.2
Public (Schools)	ha	1.1	0.5	4.6	-	6.2	
	%	17.7	8.1	74.2	-	100.0	17.7
Public (Military)	ha	3.3	2.8	48.8	-	54.9	
	%	6.0	5.1	88.9	-	100.0	6.0

Note:

/1 : Impermeable areas due to pavement.
/2 : Permeable areas where rainfall may infiltrate to some degree.

表５－３　都市化に依る流出率変化

River Basin	Name of River	Runoff Coefficient		
		1965	1984	2005
B-1	Varadero	0.54	0.62	0.66
B-2	Jardin	0.65	0.68	0.68
B-3	Centro	0.59	0.62	0.67
B-4	Jaen	0.57	0.65	0.67
B-5	Tacumbu	0.48	0.53	0.53
B-6	Salamanca	0.52	0.57	0.58
B-7	Zanja Moroti	0.63	0.64	0.65
B-8	Ferreira	0.50	0.63	0.66
B-9	Villa Universitaria	0.32	0.44	0.60
B-10	Las Mercedes	0.48	0.59	0.62
B-11	Mariscal Lopez	0.56	0.62	0.63
B-12	Bella Vista	0.50	0.63	0.65
B-13	Tablada	0.45	0.62	0.63
B-14	Mburicao	0.42	0.50	0.57
B-15	Ycua Carrillo	0.37	0.44	0.63
B-16	Santa Rosa	0.33	0.41	0.56
B-17	Tres Puentes Cue	0.30	0.35	0.41
B-18	Itay	0.33	0.41	0.50
B-19	Lambare	0.36	0.51	0.67
B-20	Valle Apua	0.30	0.38	0.40
B-21	Villa Elisa	0.31	0.40	0.51
B-22	Nemby	0.30	0.36	0.44
B-23	San Lorenzo	0.30	0.32	0.35
B-24	Tayazuape	0.30	0.32	0.35
B-26	Zeballos Cue	0.32	0.35	0.41
B-27	Paso Cai	0.32	0.34	0.52

表５－４　到達時間算定係数

River Basin Condition	Coefficient
Past (1965)	120
Present (1984)	100 or 120
Future (2005, Without Drainage Facilities)	100
Future (2000, With Drainage Facilities)	80

表５－５　流出抑制施設の効果

Type of Facilities	Return Period	Size of Facility	Maximum Discharge (m3/s) Inflow	Outflow	Regulation Effect (m^3/s)
Storage in House Lots	3-year	1 m^2	0.00381	0.00260	0.00121
	10-year	1 m^2	0.00510	0.00390	0.00120
	3-year	2 m^2	0.00381	0.00181	0.00200
	10-year	2 m^2	0.00510	0.00308	0.00202
Infiltration Facilities	3-year	10 m	0.00381	0.00305	0.00076
	10-year	10 m	0.00510	0.00434	0.00076
	3-year	20 m	0.00381	0.00229	0.00152
	10-year	20 m	0.00510	0.00358	0.00152

表5－6 (1/2) 確率流出量（流出抑制施設無しの場合）

RIVER BASIN	CATCHMENT AREA (km^2)	CASE NO.	RUNOFF COEFFICIENT	PROBABLE DISCHARGE 1.1-yr Tc	1.1-yr Q	2-yr Tc	2-yr Q	3-yr Tc	3-yr Q	5-yr Tc	5-yr Q	10-yr Tc	10-yr Q
				min	m^3/s	min	m^3/s	min	m^3/s	min	m^3/s	min	m^3/s
B-2 Jardin	0.6	1	0.65	35	4.7	25	9.5	25	11.1	25	12.9	20	16.5
		2	0.68	25	5.9	20	10.8	20	12.7	20	14.7	15	18.9
		3	0.68	25	5.9	20	10.8	20	12.7	20	14.7	15	18.9
		4	0.68	20	6.6	15	11.9	15	13.9	15	16.1	10	20.5
B-4 Jaen	2.47	1	0.57	50	13.6	40	27.3	40	32.2	35	40.3	35	47.6
		2	0.65	40	17.9	30	36.0	30	42.3	25	53.3	25	62.7
		3	0.67	40	18.5	30	37.1	30	43.6	25	54.9	25	64.7
		4	0.67	30	21.8	25	40.2	20	47.6	20	59.7	20	70.1
B-6 Salamanca	1.17	1	0.52	45	6.3	35	12.6	30	16.0	30	18.7	30	22.1
		2	0.57	35	8.1	25	16.2	25	19.0	25	22.1	20	28.3
		3	0.58	35	8.2	25	16.5	25	19.3	25	22.5	20	28.8
		4	0.58	25	9.8	20	18.0	20	21.1	20	24.5	15	31.4
B-7 Zanja Moroti	1.18	1	0.63	40	8.3	30	16.6	30	19.6	30	22.9	25	29.1
		2	0.64	30	10.0	25	18.3	25	21.5	20	27.2	20	32.0
		3	0.65	30	10.1	25	18.6	25	21.9	20	27.6	20	32.5
		4	0.65	25	11.1	20	20.3	20	23.8	15	30.3	15	35.5
B-8 Ferreira	4.0	1	0.5	65	16.2	50	34.2	45	43.0	40	53.6	40	63.4
		2	0.63	45	26.2	35	52.4	35	61.8	30	77.5	30	91.4
		3	0.66	45	27.4	35	54.9	30	64.7	30	81.2	30	95.7
		4	0.66	35	31.9	25	64.1	25	75.2	25	93.3	20	111.9
B-10 Las Mercedes	2.12	1	0.48	55	9.2	40	19.7	40	23.3	35	29.2	35	34.4
		2	0.59	40	14.0	30	28.0	30	33.0	25	41.5	25	48.9
		3	0.62	40	14.7	30	29.4	30	34.6	25	43.6	25	51.4
		4	0.62	30	17.3	25	31.9	20	37.2	20	47.4	20	55.7
B-12 Bella Vista	0.75	1	0.5	40	4.2	30	8.4	30	9.9	25	12.4	25	14.7
		2	0.63	30	6.2	25	11.5	20	14.7	20	17.0	20	20.0
		3	0.65	30	6.4	20	11.8	20	15.1	20	17.6	20	20.7
		4	0.65	20	7.8	15	13.3	15	16.6	15	19.2	15	22.6
B-14 Mburicao	16.45	1	0.42	105	38.7	80	87.2	75	108.5	70	133.9	65	166.5
		2	0.5	75	59.8	55	132.7	55	157.5	50	195.5	45	245.3
		3	0.57	70	71.8	55	151.3	50	189.9	45	236.3	45	279.6
		4	0.57	55	85.2	40	181.8	40	214.8	35	268.7	35	326.5
B-15 Ycua Carrillo	4.01	1	0.37	75	10.8	55	23.9	50	30.1	50	35.3	45	44.2
		2	0.44	55	16.0	40	34.2	40	40.4	35	50.6	35	59.7
		3	0.63	45	26.2	35	52.5	35	61.9	30	77.7	30	91.6
		4	0.63	35	30.6	25	61.3	25	72.0	25	83.9	20	107.0
B-16 Santa Rosa	3.13	1	0.33	70	7.9	55	16.7	50	20.9	45	26.0	45	30.8
		2	0.41	50	12.4	40	24.9	35	31.5	35	36.8	30	46.5
		3	0.56	45	18.2	35	36.4	30	46.2	30	53.9	30	63.6
		4	0.56	35	21.2	25	42.6	25	50.0	25	58.2	20	74.3
B-17 Tres Puentes	6.8	1	0.3	95	12.4	70	28.2	65	35.2	60	43.6	55	54.4
		2	0.35	70	18.2	55	38.4	50	48.2	45	60.0	40	75.4
		3	0.41	65	22.5	50	47.7	45	59.9	45	73.8	40	88.4
		4	0.41	50	27.0	35	57.9	35	68.3	30	85.7	30	105.7
B-18 Itay	54.55	1	0.33	170	67.3	125	163.0	115	208.1	105	263.5	100	325.0
		2	0.41	120	112.4	90	259.5	80	336.3	75	414.2	70	514.5
		3	0.5	110	147.2	80	344.0	75	428.5	70	528.5	65	657.5
		4	0.5	80	189.1	60	416.9	55	522.2	50	648.4	50	767.8

NOTE
Tc : Concentration Time (min)
Q : Run off Discharge (m3/s)

Case 1 : Under past river basin condition in 1965.
Case 2 : Under present river basin condition in 1984.
Case 3 : Under future river basin condition in 2005, without provision of drainage facilities.
Case 4 : Under future river basin condition in 2005, with provision of drainage facilities.

表5－6 (2/2) 確率流出量（流出抑制施設無しの場合）

RIVER BASIN	CATCHMENT AREA (km^2)	CASE NO.	RUNOFF COEFFICIENT	PROBABLE DISCHARGE 1.1-yr Tc	1.1-yr Q	2-yr Tc	2-yr Q	3-yr Tc	3-yr Q	5-yr Tc	5-yr Q	10-yr Tc	10-yr Q
				min	m^3/s	min	m^3/s	min	m^3/s	min	m^3/s	min	m^3/s
B-19 Lambare	25.66	1	0.36	130	43.4	95	103.0	90	127.9	80	163.8	75	203.2
		2	0.51	85	86.6	65	190.0	60	237.6	55	294.4	50	368.4
		3	0.67	75	125.1	55	277.4	55	329.2	50	408.7	45	512.6
		4	0.67	55	156.2	45	312.4	40	393.8	40	461.1	35	581.5
B-21 Villa Elisa	11.53	1	0.31	10	19.3	80	45.1	75	56.1	70	69.3	65	86.2
		2	0.4	75	33.6	55	74.4	55	88.3	50	109.6	45	137.5
		3	0.51	65	47.5	50	100.5	50	119.1	45	148.2	40	186.4
		4	0.51	50	57.0	40	114.0	35	144.1	35	168.5	30	213.2
B-22 Nemby	5.58	1	0.3	90	10.6	65	24.3	60	30.4	60	35.7	55	44.6
		2	0.36	80	13.9	60	30.7	55	38.5	55	45.2	50	56.5
		3	0.44	60	21.0	45	44.6	40	56.2	40	65.8	35	83.1
		4	0.44	45	25.5	35	51.0	30	64.7	30	75.5	30	91.2
B-23 San Lorenzo	33.69	1	0.32	150	44.9	110	107.8	100	138.3	95	169.6	85	218.1
		2	0.37	140	55.1	105	129.1	95	166.0	90	203.8	80	262.7
		3	0.4	105	75.5	80	170.0	70	221.6	65	273.8	60	341.2
		4	0.4	75	98.1	60	206.0	55	258.0	50	320.4	45	401.8
B-24 Tayazuape	30.13	1	0.3	150	37.6	110	90.4	100	116.0	95	142.2	85	182.9
		2	0.32	145	41.3	105	99.8	100	123.7	90	157.6	85	195.1
		3	0.35	105	59.1	80	128.5	75	165.7	70	204.3	65	254.2
		4	0.35	80	73.1	60	161.2	55	201.9	50	247.7	50	296.9
B-26 Zeballos Cue	0.96	1	0.32	50	3.0	40	6.0	35	7.5	35	8.8	35	10.4
		2	0.35	50	3.3	40	6.5	35	8.2	35	9.6	30	11.7
		3	0.41	35	4.8	30	8.8	25	11.2	25	13.1	25	15.4
		4	0.41	30	5.2	20	10.4	20	12.2	20	14.2	20	16.7
B-27 Paso Cai	5.49	1	0.32	85	11.6	65	25.5	60	31.9	55	39.5	50	49.5
		2	0.34	85	12.4	65	27.1	60	33.9	55	42.0	50	52.5
		3	0.52	55	25.9	40	55.4	40	65.4	35	81.8	35	96.6
		4	0.52	40	31.9	30	63.9	30	75.2	30	87.8	25	111.6

表５－７ (1/3) 確率流出量 (流出抑制施設及び排水施設無しの場合)

RIVER BASIN	CATCHMENT AREA (km^2)	RUNOFF COEFFICIENT	CASE NO.	PROBABLE DISCHARGE (m3/s) 1.1-yr	2-yr	3-yr	5-yr	10-yr
B-2 Jardin	0.6	0.66	1	5.9	10.8	12.7	14.7	18.9
			2	5.1	9.9	11.7	13.8	16.3
			3	3.9	8.9	10.8	12.9	15.4
			4	4.8	9.7	11.6	13.6	17.8
			5	4.0	8.9	10.8	12.8	17.0
			6	5.1	10.0	11.9	13.9	16.5
			7	3.8	9.3	11.1	13.1	15.7
B-4 Jaen	2.47	0.67	1	18.5	37.1	43.6	54.9	64.7
			2	16.1	33.9	40.5	51.5	61.1
			3	13.6	30.7	37.3	44.6	57.6
			4	15.5	34.1	40.6	51.9	61.7
			5	13.4	31.9	38.5	49.8	59.5
			6	16.4	34.9	41.5	52.8	62.5
			7	12.9	32.8	39.3	50.7	60.4
B-6 Salamanca	1.17	0.58	1	8.2	16.5	19.3	22.5	28.8
			2	6.9	14.8	17.7	20.9	26.9
			3	5.7	12.2	16.1	19.3	25.1
			4	6.9	15.2	18.1	21.3	27.5
			5	6.0	14.3	17.2	20.4	26.6
			6	7.3	15.6	18.4	21.6	27.9
			7	6.4	13.4	17.5	20.7	27.0
B-7 Zanja Moroti	1.18	0.65	1	10.1	18.6	21.9	27.6	32.5
			2	8.0	16.9	20.2	23.8	30.6
			3	6.7	15.3	18.5	22.2	28.8
			4	8.5	17.0	20.2	26.0	30.8
			5	6.4	15.8	19.0	24.8	29.7
			6	8.1	17.4	20.7	24.3	31.3
			7	6.9	16.3	19.5	23.1	30.1
B-8 Ferreira	4.0	0.66	1	27.4	54.9	64.7	81.2	95.7
			2	23.8	50.2	60.1	76.1	90.5
			3	19.1	45.5	55.4	71.1	85.3
			4	22.4	49.9	64.6	76.2	90.7
			5	18.8	46.3	61.0	72.6	87.2
			6	23.8	51.3	61.1	77.6	92.2
			7	18.4	47.7	57.6	74.0	88.6
B-10 Las Mercedes	2.12	0.62	1	14.7	29.4	34.6	43.6	51.4
			2	12.6	26.7	31.9	40.7	48.3
			3	10.5	24.0	29.2	37.7	45.3
			4	12.2	26.9	32.1	41.1	48.8
			5	10.4	25.1	30.3	39.3	47.0
			6	12.9	27.6	32.8	41.8	49.6
			7	10.0	25.8	31.0	40.0	47.8
B-12 Bella Vista	0.75	0.65	1	6.4	11.8	15.1	17.6	20.7
			2	5.5	10.8	14.0	16.4	19.5
			3	4.6	9.7	12.8	15.3	18.3
			4	5.5	11.9	14.2	16.6	19.7
			5	4.8	11.3	13.5	15.9	19.0
			6	5.7	11.1	14.4	16.9	20.0
			7	5.0	10.4	13.7	16.2	19.3
B-14 Mburicao	16.45	0.57	1	71.8	151.3	189.9	236.3	279.6
			2	59.6	137.6	175.0	208.0	262.9
			3	49.0	123.8	152.0	193.1	246.1
			4	56.1	135.6	174.2	220.6	263.9
			5	41.3	124.4	163.0	209.4	252.7
			6	53.8	140.1	178.7	211.7	268.4
			7	39.6	120.9	157.1	200.5	257.2

Note:

Case 1 : Without detention facilities.
Case 2 : Storage facilities in public compound utilizing 2.5% of river basin area.
Case 3 : Storage facilities in public compound utilizing 5% of river basin area.
Case 4 : Storage facilities in house lots with capacity of 1.0 m^3.
Case 5 : Storage facilities in house lots with capacity of 2.0 m^3.
Case 6 : Infiltration facilities with the length of 10 m.
Case 7 : Infiltration facilities with the length of 20 m.

表5－7 (2/3) 確率流出量（流出抑制施設及び排水施設無しの場合）

RIVER BASIN	CATCHMENT AREA (km^2)	RUNOFF COEFFICIENT	CASE NO.	PROBABLE DISCHARGE (m3/s)				
				1.1-yr	2-yr	3-yr	5-yr	10-yr
B-15	4.01	0.63	1	26.2	52.5	61.9	77.7	91.6
Ycua Carrillo			2	22.7	47.8	57.3	72.6	86.4
			3	18.0	43.1	52.6	67.5	81.1
			4	21.0	47.3	56.7	72.5	86.4
			5	17.3	43.6	53.0	68.8	82.7
			6	20.8	48.8	58.2	74.0	87.9
			7	15.6	41.6	54.5	70.3	84.2
B-16	3.13	0.56	1	18.2	36.4	46.2	53.9	63.6
Santa Rosa			2	15.4	32.8	39.3	49.9	59.5
			3	11.9	29.1	35.7	46.0	55.4
			4	14.3	32.6	42.3	50.0	59.7
			5	11.6	29.8	39.6	47.3	56.9
			6	14.2	33.7	40.2	51.1	60.8
			7	10.3	30.9	37.4	48.4	58.0
B-17	6.8	0.41	1	22.5	47.7	59.9	73.8	88.4
Tres Puentes Cue			2	18.3	41.5	53.3	63.6	80.9
			3	13.6	35.3	44.2	57.0	73.4
			4	19.2	44.3	56.6	66.9	85.0
			5	16.8	41.9	54.2	64.5	82.6
			6	20.1	45.3	57.5	67.9	86.0
			7	16.5	42.8	55.1	65.5	83.6
B-18	54.55	0.5	1	147.2	344.0	428.5	528.5	657.5
Itay			2	126.4	299.9	394.1	491.5	616.0
			3	108.4	270.2	345.9	454.5	574.6
			4	102.4	299.4	383.7	483.7	612.8
			5	70.5	267.4	351.8	451.8	580.8
			6	100.5	297.7	378.1	496.5	625.5
			7	64.2	252.5	346.2	441.2	593.6
B-19	25.66	0.67	1	125.1	277.4	329.2	408.7	512.6
Lambare			2	106.7	242.9	307.7	385.5	486.6
			3	94.2	223.0	286.2	362.3	435.6
			4	89.4	241.8	293.5	373.1	477.0
			5	58.0	216.3	268.0	347.6	451.5
			6	88.3	237.3	303.7	383.2	487.2
			7	57.9	198.6	278.2	357.8	433.0
B-21	11.53	0.51	1	47.5	100.5	119.1	148.2	186.4
Villa Elisa			2	38.4	85.3	108.7	136.9	173.7
			3	30.7	75.6	98.2	125.6	151.9
			4	34.0	89.5	108.1	137.2	175.3
			5	26.1	81.6	100.2	129.3	167.4
			6	34.9	87.0	111.2	140.3	178.5
			7	25.0	79.1	103.3	132.4	159.6
B-22	5.58	0.44	1	21.0	44.6	56.2	65.8	83.1
Nemby			2	17.2	39.1	47.3	59.9	76.4
			3	12.9	31.9	41.8	54.0	65.5
			4	17.6	41.2	52.8	62.4	79.6
			5	15.2	38.8	50.4	60.0	77.2
			6	18.6	42.2	50.3	63.4	80.6
			7	15.0	39.7	47.9	61.0	78.2
B-23	33.69	0.4	1	75.5	170.0	221.6	273.8	341.2
San Lorenzo			2	62.4	150.4	190.5	238.3	299.3
			3	51.0	126.1	169.3	215.4	273.7
			4	61.1	155.6	207.2	259.3	326.7
			5	50.7	145.2	196.9	249.0	316.4
			6	62.4	159.7	201.4	250.8	314.5
			7	44.8	142.3	191.1	240.5	304.2

表５－７ (3/3) 確率流出量（流出抑制施設及び排水施設無しの場合）

RIVER BASIN	CATCHMENT AREA (km^2)	RUNOFF COEFFICIENT	CASE NO.	PROBABLE DISCHARGE (m3/s)				
				1.1-yr	2-yr	3-yr	5-yr	10-yr
B-24 Tayazuape	30.13	0.35	1	59.1	128.5	165.7	204.3	254.2
			2	46.3	111.0	146.7	183.9	231.3
			3	37.1	94.6	123.1	163.5	208.4
			4	51.6	127.7	160.3	199.0	248.9
			5	47.8	123.9	156.5	195.2	245.1
			6	53.1	129.2	161.9	200.5	250.4
			7	47.3	119.9	158.1	196.7	246.6
B-26 Zeballos Cue	0.96	0.41	1	4.8	8.8	11.2	13.1	15.4
			2	3.5	7.6	9.1	11.7	14.0
			3	2.5	6.3	7.9	10.4	12.6
			4	4.5	8.5	10.9	12.8	15.1
			5	4.2	8.3	10.7	12.6	14.9
			6	4.5	8.6	11.0	12.9	15.2
			7	4.0	8.4	9.9	12.6	15.0
B-27 Paso Cai	5.49	0.52	1	25.9	55.4	65.4	81.8	96.6
			2	21.9	46.5	59.5	75.4	90.0
			3	17.0	41.1	53.7	64.9	83.4
			4	21.2	50.6	60.7	77.1	91.9
			5	17.9	47.3	57.3	73.7	88.5
			6	22.6	48.5	62.0	78.4	93.2
			7	17.7	45.1	58.7	69.8	89.8

表5－8 (1/3) 確率流出量 (流出抑制施設及び排水施設有りの場合)

RIVER BASIN	CATCHMENT AREA (km^2)	RUNOFF COEFFICIENT	CASE NO.	PROBABLE DISCHARGE (m3/s) 1.1-yr	2-yr	3-yr	5-yr	10-yr
B-2 Jardin	0.6	0.68	1	6.6	11.9	13.9	16.1	20.5
			2	5.6	10.6	12.8	15.1	17.8
			3	4.7	9.8	11.8	14.0	16.8
			4	5.5	10.8	12.8	15.0	17.8
			5	4.7	10.0	12.0	14.2	17.0
			6	5.8	11.1	13.1	15.3	18.1
			7	5.0	10.3	12.3	14.5	17.3
B-4 Jaen	2.47	0.67	1	21.8	40.2	47.6	59.7	70.1
			2	18.8	36.7	47.5	55.9	66.2
			3	15.8	33.1	40.2	52.0	62.3
			4	18.8	37.2	48.4	56.7	67.1
			5	16.7	35.1	46.2	54.5	65.0
			6	19.7	38.0	49.2	57.5	68.0
			7	17.6	35.9	42.9	55.4	65.8
B-6 Salamanca	1.17	0.58	1	9.8	18.0	21.1	24.5	31.4
			2	8.2	16.1	19.2	22.7	29.3
			3	6.6	14.3	17.4	20.9	27.3
			4	8.6	16.7	19.8	23.2	30.1
			5	7.7	15.8	18.9	22.3	29.2
			6	8.9	17.1	20.2	23.6	30.5
			7	7.2	16.2	19.3	22.7	29.6
B-7 Zanja Morotí	1.18	0.65	1	11.1	20.3	23.8	30.3	35.5
			2	9.5	18.5	22.0	25.8	33.4
			3	7.9	16.6	20.1	24.0	31.3
			4	9.5	18.7	22.1	28.6	33.8
			5	8.3	17.5	21.0	27.4	32.6
			6	9.9	19.1	22.6	26.5	34.3
			7	8.8	18.0	21.4	25.3	33.1
B-8 Ferreira	4.0	0.66	1	31.9	64.1	75.2	93.3	111.9
			2	27.6	58.4	69.6	82.1	105.5
			3	23.2	48.8	64.0	76.5	91.7
			4	26.9	59.1	70.2	82.6	106.8
			5	23.4	55.5	66.7	79.0	103.3
			6	28.4	60.5	71.7	84.1	108.3
			7	24.8	52.0	68.1	80.5	104.7
B-10 Las Mercedes	2.12	0.62	1	17.3	31.9	37.2	47.4	55.7
			2	14.8	28.9	37.5	44.1	52.3
			3	12.2	25.9	31.5	40.9	49.0
			4	14.8	29.4	38.3	44.9	53.2
			5	13.0	27.6	36.5	43.1	51.4
			6	15.5	30.1	39.0	45.6	53.9
			7	13.7	28.3	37.2	43.8	52.1
B-12 Bella Vista	0.75	0.65	1	7.8	13.3	16.6	19.2	22.6
			2	6.7	11.7	15.3	17.9	21.2
			3	5.0	10.5	14.0	16.7	19.9
			4	6.9	13.3	15.6	18.3	21.6
			5	6.2	12.6	14.9	17.6	20.1
			6	7.2	12.2	15.9	18.5	21.9
			7	5.7	11.5	15.2	17.8	21.2
B-14 Mburicao	16.45	0.57	1	85.2	181.8	214.8	268.7	326.5
			2	73.1	164.2	197.2	249.6	297.5
			3	58.0	138.0	179.7	230.6	277.8
			4	69.5	166.1	199.1	253.0	301.5
			5	58.3	154.9	187.9	241.8	290.3
			6	74.0	170.6	203.6	257.4	306.0
			7	57.8	148.0	192.4	246.2	294.8

Note:

Case 1 : Without detention facilities.
Case 2 : Storage facilities in public compound utilizing 2.5% of river basin area.
Case 3 : Storage facilities in public compound utilizing 5% of river basin area.
Case 4 : Storage facilities in house lots with capacity of 1.0 m^3.
Case 5 : Storage facilities in house lots with capacity of 2.0 m^3.
Case 6 : Infiltration facilities with the length of 10 m.
Case 7 : Infiltration facilities with the length of 20 m.

表５－８ (2/3) 確率流出量（流出抑制施設及び排水施設有りの場合）

RIVER BASIN	CATCHMENT AREA (km^2)	RUNOFF COEFFICIENT	CASE NO.	PROBABLE DISCHARGE (m3/s)				
				1.1-yr	2-yr	3-yr	5-yr	10-yr
B-15 Ycua Carrillo	4.01	0.63	1	30.6	61.3	72.0	83.9	107.0
			2	26.2	51.4	66.4	78.3	93.0
			3	21.8	46.3	60.7	72.7	87.2
			4	25.4	56.1	66.8	78.7	101.8
			5	21.7	52.4	63.1	75.0	98.1
			6	26.9	52.9	68.3	80.1	95.0
			7	20.8	49.2	64.6	76.4	91.3
B-16 Santa Rosa	3.13	0.56	1	21.2	42.6	50.0	58.2	74.3
			2	17.8	38.1	45.6	53.8	69.3
			3	14.4	31.2	41.2	49.5	59.5
			4	17.3	38.7	46.1	54.3	70.4
			5	14.6	35.9	43.3	51.6	67.6
			6	18.4	39.8	47.2	55.4	71.5
			7	14.1	33.7	44.4	52.7	63.0
B-17 Tres Puentes Cue	6.8	0.41	1	27.0	57.9	68.3	85.7	105.7
			2	21.5	46.8	60.4	72.0	92.2
			3	16.0	39.5	52.5	64.1	83.3
			4	23.6	54.6	65.0	82.4	97.7
			5	21.2	52.2	62.6	80.0	95.3
			6	24.6	51.6	65.9	77.5	98.7
			7	22.2	49.2	63.5	75.1	96.3
B-18 Itay	54.55	0.5	1	189.1	416.9	522.2	648.4	767.8
			2	156.0	374.6	476.5	567.8	716.4
			3	127.3	317.4	410.3	522.0	665.1
			4	144.3	372.2	477.5	603.7	723.1
			5	112.4	340.2	445.5	571.7	691.1
			6	140.7	364.0	463.2	581.6	735.9
			7	101.6	332.1	431.2	549.7	703.9
B-19 Lambare	25.66	0.67	1	156.2	312.4	393.8	461.1	581.5
			2	129.7	287.1	366.4	433.8	550.8
			3	112.4	261.9	339.1	406.5	520.1
			4	120.6	276.7	358.1	425.4	545.9
			5	85.9	251.2	332.7	399.9	520.4
			6	121.6	286.9	368.3	435.6	556.1
			7	88.0	261.4	318.7	410.1	530.6
B-21 Villa Elisa	11.53	0.51	1	57.0	114.0	144.1	168.5	213.2
			2	47.7	101.7	130.7	155.1	198.2
			3	36.4	89.3	110.1	141.8	171.3
			4	45.9	103.0	133.1	157.4	202.2
			5	38.0	95.1	125.2	149.5	194.3
			6	45.5	106.1	136.2	160.6	205.3
			7	34.4	98.2	118.9	152.7	183.1
B-22 Nemby	5.58	0.44	1	25.5	51.0	64.7	75.5	91.2
			2	20.5	44.5	53.7	68.4	81.7
			3	14.8	38.0	47.2	61.4	74.4
			4	22.1	47.6	61.3	72.1	85.6
			5	19.6	45.2	58.9	69.7	83.2
			6	23.0	48.6	62.3	73.1	86.6
			7	18.9	46.2	55.3	70.6	84.2
B-23 San Lorenzo	33.69	0.4	1	98.1	206.0	258.0	320.4	401.8
			2	77.0	179.9	229.8	289.9	347.6
			3	58.9	153.7	201.5	246.6	315.9
			4	83.6	191.5	243.6	305.9	387.4
			5	68.6	181.2	233.3	295.6	377.1
			6	83.1	195.7	247.7	310.1	391.5
			7	68.5	185.3	237.4	299.7	358.7

表5－8 (3/3) 確率流出量 (流出抑制施設及び排水施設有りの場合)

RIVER BASIN	CATCHMENT AREA (km^2)	RUNOFF COEFFICIENT	CASE NO.	PROBABLE DISCHARGE (m3/s)				
				1.1-yr	2-yr	3-yr	5-yr	10-yr
B-24 Tayazuape	30.13	0.35	1	73.1	161.2	201.9	247.7	296.9
			2	56.2	137.8	176.7	212.0	268.5
			3	42.7	109.7	144.6	186.7	240.1
			4	67.8	155.9	196.6	245.4	291.5
			5	64.0	152.1	192.8	241.6	287.7
			6	69.3	157.4	198.1	246.9	293.1
			7	62.2	153.6	194.3	229.6	289.3
B-26 Zeballos Cue	0.96	0.41	1	5.2	10.4	12.2	14.2	16.7
			2	4.0	8.2	10.7	12.7	15.2
			3	2.9	6.8	9.2	11.2	13.6
			4	4.9	10.1	11.9	13.9	16.4
			5	4.7	9.9	11.7	13.7	16.2
			6	5.0	10.2	12.0	14.0	16.5
			7	4.8	9.1	11.8	13.8	16.2
B-27 Paso Cai	5.49	0.52	1	31.9	63.9	75.2	87.8	111.6
			2	26.5	52.9	68.2	80.8	103.7
			3	19.9	46.5	61.2	73.9	95.8
			4	27.2	59.2	70.5	83.1	106.9
			5	23.8	55.9	67.2	79.7	103.5
			6	28.5	56.0	71.9	84.4	108.2
			7	22.9	52.6	68.5	81.1	104.8

表5－9　流出抑制施設の概要

Type	Facility	Flood Control Effect	Economic Consideration	Maintenance Requirement	Safety Consideration	Legislation Requirement
Storage	Parking Lot Storage	Highly effective in discharge retardation over parking lots	Higher in cost due to shallow depth of storage	No special problem	No danger at the time of collapse due to simple construction	Require legislation for enforcement of installation
	Between-House Storage	Highly effective in discharge retardation in multiple dwelling area	Relatively lower in cost	Require maintenance to eliminate sanitary problems	Require safety measures to keep off small children	-ditto-
	Storage in Park	Good possibilities for discharge retardation only in park but also in vicinities; highly effective	-ditto-	Require precaution against accidents	Require safety measures to prevent accidents and to keep off small children	Problem on legislation may be less because it will be under the control of government authorities
	Storage in Public Compound	Larger compound; discharge retardation over its vicinity can also be expected; highly effective	-ditto-	-ditto-	-ditto-	-ditto-
	Storage in House Lot	Discharge retardation against an increase caused by housing lot development is great	Generally higher in cost, but possible to lower by adoption of different construction method	For maintenance require close cooperation of residents	- - -	Require legislation for enforcement of installation
Infiltration	Infiltration Inlet and Trench	-ditto-	Generally higher in cost when compared with storage type	Require maintenance for clogging prevention	- - -	Require legislation for installation in private lot; installation along roads by governemnt authorities may be simpler in procedure
	Infiltration Well	-ditto-	-ditto-	Difficult to maintain	Possibility of subsidence at fill-up gound	Require legislation for enforcement of installation

表6－1　計画対象流域

Basin Number	Name of Basin	Area (ha)	Remarks
B-1	Varadero	325	
B-2	Jardin	60	
B-3	Centro	724	
B-4	Jaen	247	
B-5	Tacumbu	170	
B-6	Salamanca	143	
B-7	Zanja Moroti	161	
B-8	Ferreira	400	
B-9	Villa Universitaria	240	
B-10	Las Mercedes	212	
B-11	Mariscal Lopez	66	
B-12	Bella Vista	75	
B-13	Tablada	103	
B-14	Mburicao	1,645	
B-15	Ycua Carrillo	401	
B-16	Santa Rosa	313	
B-17	Tres Puentes Cue	680	
B-18	Itay	5,455	Subbasin No. 8, No. 9 and No. 10 are excluded.
B-19	Lambare	2,566	
B-20	Valle Apua	1,063	
B-21	Villa Elisa	955	Subbasin No. 2 is excluded.
B-22	Nemby	558	Subbasin No. 2 to No. 5 are excluded.
B-23	San Lorenzo	3,369	
B-24	Tayazuape	2,465	Subbasin No. 2 is excluded.
B-26	Zeballos Cue	213	
B-27	Paso Cai	549	
	Total	23,158	

表6－2　ベイシック・プラン代替案における建設費

(Unit: ₲ million)

Basin Number	Name of Basin or River	Case I	Case II /2	Case III /2
1.	Basins with River Channel			
B-2	Jardin	620	930	790
B-4	Jaen	3,120	3,690	3,410
B-6	Salamanca	1,550	1,990	1,790
B-7	Zanja Moroti	2,470	2,500	2,480
B-8	Ferreira	4,100	5,220	4,710
B-10	Las Mercedes	2,810	3,100	2,850
B-12	Bella Vista	750	900	860
B-14	Mburicao	21,660	24,580	22,980
B-15	Ycua Carrillo	5,640	6,060	5,900
B-16	Santa Rosa	3,500	4,220	3,870
B-17	Tres Puentes Cue	5,020	5,310	5,180
B-18	Itay	61,990	63,460	62,300
B-19	Lambare	34,000	36,610	34,460
B-21	Villa Elisa	9,090	11,670	16,830
B-22	Nemby	4,620	5,440	5,050
B-23	San Lorenzo	20,940	25,820	24,130
B-24	Tayazuape	9,710	13,110	12,120
B-26	Zeballos Cue	980	1,120	1,070
B-27	Paso Cai	4,340	5,640	5,230
	Sub-Total	196,910	221,370	210,010
2.	Basins without River Channel /1			
B-1	Varadero	3,220	3,220	3,220
B-3	Centro	7,390	7,390	7,390
B-5	Tacumbu	1,150	1,150	1,150
B-9	Villa Universitaria	2,270	2,270	2,270
B-11	Mariscal Lopez	650	650	650
B-13	Tablada	1,020	1,020	1,020
B-20	Valle Apua	8,330	8,330	8,330
	Sub-Total	24,030	24,030	24,030
	Total	220,940	245,400	234,040

Note:

/1 Only drainage facilities are applied to these basins in all the study cases, because the cost is absolutely less than that of the combination with detention facilities.

/2 Costs of Case II and Case III were estimated on the assumption that about 15% of the design discharge are regulated by detention facilities.

表6－3　ベイシック・プラン代替案における必要用地と移転家屋

Basin Number	Name of Basin	Land Acquisition (m^2)		House Evacuation (No.)		Remarks
		Case I	Case II and III /1	Case I	Case II and III /1	
B-1	Varadero	-	-	-	-	No river
B-2	Jardin	-	-	-	-	River improvement is not required
B-3	Centro	-	-	-	-	No river
B-4	Jaen	9,500	5,900	14	7	
B-5	Tacumbu	-	-	-	-	No river
B-6	Salamanca	3,700	3,700	0	0	
B-7	Zanja Moroti	8,400	7,900	24	12	
B-8	Ferreira	16,800	14,800	20	15	
B-9	Villa Universitaria	-	-	-	-	No river
B-10	Las Mercedes	7,500	4,900	18	11	
B-11	Mariscal Lopez	-	-	-	-	No river
B-12	Bella Vista	-	-	-	-	River improvement is not required
B-13	Tablada	-	-	-	-	No river
B-14	Mburicao	42,300	36,500	40	24	
B-15	Ycua Carrillo	17,500	8,600	26	12	
B-16	Santa Rosa	14,400	7,600	21	10	
B-17	Tres Puentes Cue	6,000	6,000	-	-	
B-18	Itay	354,000	287,800	146	110	
B-19	Lambare	47,700	23,300	51	27	
B-20	Valle Apua	-	-	-	-	No river
B-21	Villa Elisa	62,800	62,800	-	-	
B-22	Nemby	14,200	14,200	-	-	
B-23	San Lorenzo	320,500	320,500	-	-	
B-24	Tayazuape	183,600	183,600	-	-	
B-26	Zeballos Cue	4,000	4,000	-	-	
B-27	Paso Cai	64,000	64,000	-	-	
	Total	1,160,900	1,056,100	360	228	

Note:

/1 : Results of Case II-2 and III-2 are shown.

表6－4 (1/2) ベイシック・プラン計画流量

No. of Basin	Name of Basin	No. of Subbasin	Design Discharge (m^3/s)	Remarks
B-1	Varadero	-	-	No River
B-2	Jardin	-	20	
B-3	Centro	-	-	No River
B-4	Jaen	-	70	
B-5	Tacumbu	-	-	No River
B-6	Salamanca	-	35	
B-7	Zanja Moroti	1	25	
		2	36	
B-8	Ferreira	1	85	
		2	115	
B-9	Villa Universitaria	-	-	No River
B-10	Las Mercedes	-	56	
B-11	Mariscal Lopez	-	-	No River
B-12	Bella Vista	-	25	
B-13	Tablada	-	-	No River
B-14	Mburicao	1	100	
		2	135	
		3	95	
		4	260	
		5	40	
		6	320	
B-15	Ycua Carrillo	1	50	
		2	110	
B-16	Santa Rosa	-	75	
B-17	Tres Puentes Cue	-	105	

表6－4 (2/2) ベイシック・プラン計画流量

No. of Basin	Name of Basin	No. of Subbasin	Design Discharge (m^3/s)	Remarks
B-18	Itay	1	320	
		2-1	360	
		2-2	200	
		3-1	50	
		3-2	50	
		4	95	
		5	110	
		6	670	
		7-1	160	Subbasins 8 to 10 are outside the Planning area
		7-2	60	
		7-3	35	
B-19	Lambare	1	115	
		2	75	
		3	340	
		4	450	
		5	130	
		6	190	
		7	590	
B-20	Valle Apua	-	-	No River
B-21	Villa Elisa	1	70	
				Subbasin 2 is outside the Planning Area
		3	220	
B-22	Nemby	1	90	Subbasins 2-5 are outside the Planning Area
B-23	San Lorenzo	1	230	
		2-1	290	
		2-2	95	
		2-3	410	
B-24	Tayazuape	1	170	
				Subbasin 2 is outside the Planning Area
		3	300	
B-26	Zeballos Cue	-	17	
B-27	Paso Cai	-	115	

表６－５　河川改修設計基準

Type of Channel	Maximum Allowable Velocity (m/s)	Roughness Coefficient	Freeboard /1 Q>30m³/s	Freeboard /1 Q<30m³/s
Channel Without Revetment (Type A)	3.0	0.035	0.6	0.3
Channel With Revetment and Without Invert (Type B)	4.0	0.025	0.6	0.3
Channel With Revetment and Invert (Type C)	5.0	0.020	0.6	0.3
Box Culvert (Type D)	5.0	0.020	0.6	- /2
Channel With Embankment and Revetment (Type E)	4.0	0.025	0.6	- /2

Note:

/1 Q: Design Discharge

/2 : Design discharges of Channel with Embankment and Revetment, and Box Culvert are bigger than 30 m^3/s.

表６－６　排水計画における流出係数

Basin Number	Name of Basin or River	Runoff Coefficient (%) 1984	1995	2005
B-1	Varadero	63	65	67
B-2	Jardin	67	68	68
B-3	Centro	61	64	67
B-4	Jaen	65	66	67
B-5	Tacumbu	63	63	63
B-6	Salamanca	57	58	58
B-7	Zanja Moroti	64	65	65
B-8	Ferreira	63	65	66
B-9	Villa Universitaria	44	52	60
B-10	Las Mercedes	59	61	62
B-11	Mariscal Lopez	64	64	64
B-12	Bella Vista	63	64	65
B-13	Tablada	64	64	64
B-14	Mburicao	50	54	57
B-15	Ycua Carrillo	44	54	63
B-16	Santa Rosa	49	59	68
B-17	Tres Puentes Cue	51	63	75
B-18	Itay	45	51	56
B-19	Lambare	51	59	67
B-20	Valle Apua	42	47	52
B-21	Villa Elisa	42	47	51
B-22	Nemby	41	47	52
B-23	San Lorenzo	43	48	52
B-24	Tayazuape	40	45	49
B-26	Zeballos Cue	40	45	49
B-27	Paso Cai	43	53	63

表6－7　住宅地域における屋根面積及び不浸透地域面積

Item	House Lot Average Area (ha)	Rooftop Area (ha)	Impermeable Area (ha)
High Density Residential Area	14.4 (100%)	9.1 (60%)	5.3 (40%)
Medium Density Residential Area	11.5 (100%)	4.8 (40%)	6.7 (60%)
Low Density Residential Area	4.4 (100%)	2.8 (60%)	1.6 (40%)

表6－8　流出量1㎥を抑制するために必要な流出抑制施設

Basin Number	Name of Basin or River	Storage in Public Compounds (ha)	Infiltration Trench (m)	Storage in House Lots (m^3)
With Drainage Facilities				
B-2	Jardin	1.4	12,800	1,000
B-4	Jaen	1.7	12,000	1,000
B-6	Salamanca	1.6	12,300	980
B-7	Zanja Moroti	1.3	9,800	990
B-8	Ferreira	1.7	12,300	1,000
B-10	Las Mercedes	1.7	12,900	1,010
B-12	Bella Vista	1.3	10,000	1,060
B-14	Mburicao	2.3	12,500	1,030
B-15	Ycua Carrillo	1.4	8,300	1,000
B-16	Santa Rosa	1.7	11,100	1,000
B-17	Tres Puentes Cue	1.9	8,400	1,030
B-18	Itay	2.6	8,900	1,010
B-19	Lambare	2.4	11,600	990
B-21	Villa Elisa	2.1	10,700	1,010
B-22	Nemby	2.0	11,800	1,010
B-23	San Lorenzo	2.7	11,000	990
B-24	Tayazuape	2.9	11,100	1,020
B-26	Zeballos Cue	1.6	11,700	1,030
B-27	Paso Cai	1.9	10,200	1,000
Without Drainage Facilities				
B-2	Jardin	1.4	9,700	1,000
B-4	Jaen	1.9	12,700	1,000
B-6	Salamanca	1.8	12,000	980
B-7	Zanja Moroti	1.5	9,300	990
B-8	Ferreira	1.9	10,500	1,000
B-10	Las Mercedes	2.0	12,600	1,010
B-12	Bella Vista	1.5	10,600	1,010
B-14	Mburicao	2.5	9,800	1,020
B-15	Ycua Carrillo	2.2	11,500	1,000
B-16	Santa Rosa	1.9	10,300	1,010
B-17	Tres Puentes Cue	2.7	12,700	1,010
B-18	Itay	2.8	10,100	1,010
B-19	Lambare	2.6	10,400	1,000
B-21	Villa Elisa	2.5	10,200	980
B-22	Nemby	2.3	10,600	1,010
B-23	San Lorenzo	3.2	7,800	1,010
B-24	Tayazuape	4.0	11,100	950
B-26	Zeballos Cue	1.7	11,000	1,030
B-27	Paso Cai	2.1	10,300	1,000

Note: Detention facilities are not employed in basins without rivers.

表6－9　流出抑制施設の建設費比較
(ベイシック・プラン)

(Unit: ¢ million)

Basin Number	Name of Basin	Case II	Case III
B-2	Jardin	360	230
B-4	Jaen	860	580
B-6	Salamanca	570	380
B-7	Zanja Moroti	280	260
B-8	Ferreira	1,560	1,050
B-10	Las Mercedes	720	470
B-12	Bella Vista	230	180
B-14	Mburicao	5,340	3,740
B-15	Ycua Carrillo	1,390	1,230
B-16	Santa Rosa	1,250	900
B-17	Tres Puentes Cue	1,320	1,190
B-18	Itay	9,390	8,230
B-19	Lambare	7,920	5,770
B-21	Villa Elisa	3,610	2,770
B-22	Nemby	1,340	950
B-23	San Lorenzo	7,240	5,550
B-24	Tayazuape	4,480	3,490
B-26	Zeballos Cue	190	130
B-27	Paso Cai	1,800	1,390
	Total	49,850	38,490

Note: Only drainage facilities are applied to basins without river in all the study cases, because the cost is absolutely less than that of the combination with detention facilities.

Costs of Case II and Case III have been estimated on the assumption that about 15% of the design discharge is regulated by detention facilities.

表6－10 洪水防御施設計画の概要
(ベイシック・プラン)

Basin Number	Name of Basin	River			Drainage Facilities Improvement Area (ha)	Detention Facilities		Remarks
		Design Discharge (m^3/s)	Type of /1 Channel	Improvement Length (km)		Storage in Public Compounds (ha)	Storage in House Lots (m^3)	
B-1	Varadero	-	-	-	314	-	-	No river.
B-2	Jardin	20	-	-	60	-	-	Improvement not necessary.
B-3	Centro	-	-	-	706	-	-	No river.
B-4	Jaen	62	B	1.9	247	6.8	4,000	
B-5	Tacumbu	-	-	-	117	-	-	No river.
B-6	Salamanca	35	D	1.8	143	-	-	
B-7	Zanja Moroti	30	E	0.6	161	3.9	3,000	
B-8	Ferreira	100	E	0.7	400	12.8	7,500	
B-9	Villa Universitaria	-	-	-	240	-	-	No river.
B-10	Las Mercedes	48	C	1.4	212	6.8	4,000	
B-11	Mariscal Lopez	-	-	-	66	-	-	No river.
B-12	Bella Vista	25	-	-	75	-	-	Improvement not necessary.
B-13	Tablada	-	-	-	103	-	-	No river.
B-14	Mburicao	270	B	6.5				
			C	2.2				
	Sub-Total			8.7	1,645	57.5	25,800	
B-15	Ycua Carrillo	85	B	3.0	401	17.5	12,500	
B-16	Santa Rosa	64	B	2.4	229	9.4	5,500	
B-17	Tres Puentes Cue	105	B	6.0	224	-	-	
B-18	Itay	650	A	12.6				
			B	10.4				
			D	2.5				
	Sub-Total			25.5	4,064	135.0	50,500	
B-19	Lambare	470	B	6.2				
			C	1.4				
			D	0.8				
	Sub-Total			8.4	2,566	144.0	59,400	
B-20	Valle Apua	-	-	-	968	-	-	No river.
B-21	Villa Elisa	70	A	3.4	955	-	-	
B-22	Nemby	90	A	3.5	371	-	-	
B-23	San Lorenzo	410	A	14.2				
			B	1.6				
	Sub-Total			15.8	1,759	-	-	
B-24	Tayazuape	300	A	8.1	701	-	-	
B-26	Zeballos Cue	17	A	0.4	117	-	-	
B-27	Paso Cai	115	A	4.0	375	-	-	
	Total			95.6	17,219	393.7	172,200	

/1 Type of Channel; A : Channel Without Revetment
B : Channel With Revetment and Without Invert
C : Channel With Revetment and Invert
D : Box Culvert
E : Channel With Embankment

表6－11 (1/2)　河川改修必要幅（ベイシック・プラン）

Basin Number	Name of Basin	Subbasin Number	Required Width (m)		
			River Width	Maintenance Road /1	Total
B-2	Jardin	- /2	5.3	2.0	7.3
B-4	Jaen	-	9.6	2.0	11.6
B-6	Salamanca	-	7.5	2.0	9.5
B-7	Zanja Moroti	1 /2	5.3	2.0	7.3
		2-1 /2	5.5	2.0	7.5
		2-2	25.1	(6.0)	25.1
B-8	Ferreira	1 /2	9.0	2.0	11.0
		2-1 /2	10.4	2.0	12.4
		2-2	36.1	(6.0)	36.1
B-10	Las Mercedes	1	6.5	2.0	8.5
		2	6.5	2.0	8.0
B-12	Bella Vista	- /2	6.0	2.0	8.0
B-14	Mburicao	1	11.7	2.0	13.7
		2	12.7	2.0	14.7
		3	10.6	2.0	12.6
		4	20.6	2.0	22.6
		5	8.3	2.0	10.3
		6	25.0	2.0	27.0
B-15	Ycua Carrillo	1	6.4	2.0	8.4
		2	10.4	2.0	12.4
B-16	Santa Rosa	-	9.8	2.0	11.8
B-17	Tres Puentes Cue	-	12.2	2.0	14.2
B-18	Itay	1	19.2	-	19.2
		2-1	24.4	1.0	25.4
		2-2	33.0	4.0	37.0
		3-1	7.5	1.0	8.5
		3-2	8.0	4.0	12.0
		4	27.7	4.0	31.7

Note: /1 : Width of the maintenance road depends on the type of channel (refer to Fig. 6-4.)
/2 : River improvement is not required.

表6－11 (2/2) 河川改修必要幅 (ベイシック・プラン)

Basin Number	Name of Basin	Subbasin Number	Required Width (m)		
			River Width	Maintenance Road /1	Total
B-18	Itay (Cont.)	5	12.6	4.0	16.6
		6	51.0	4.0	55.0
		7-1	24.0	4.0	28.0
		7-2	15.9	4.0	19.9
		7-3	13.0	4.0	17.0
B-19	Lambare	1	8.6	2.0	10.6
		2	7.7	2.0	9.7
			8.0	-	8.0
		3	17.7	4.0	21.7
		4	21.3	4.0	25.3
		5 /2	-	-	-
		6 /2	-	-	-
		7	28.0	4.0	32.0
B-21	Villa Elisa	1	19.9	4.0	23.9
		3	31.8	4.0	35.8
B-22	Nemby	1	23.5	4.0	27.5
B-23	San Lorenzo	1	25.2	4.0	29.2
			16.2	4.0	20.2
		2-1	49.0	4.0	53.0
		2-2	25.0	4.0	29.0
		2-3	60.9	4.0	64.9
B-24	Tayazuape	1	29.0	4.0	33.0
		3	52.0	4.0	56.0
B-26	Zeballos Cue	-	14.0	4.0	18.0
B-27	Paso Cai	-	26.0	4.0	30.0

Note: /1 : Width of the maintenance road depends on the type of channel (refer to Fig. 6-4.)
/2 : River improvement is not required.

表 6－12　洪水防御施設建設費

(ベイシック・プラン)

(Unit: ¢ Million)

Basin Number	Name of Basin or River	River	Drainage Facilities	Detention Facilities	Total
B-1	Varadero	-	3,220	-	3,220
B-2	Jardin	-	620	-	620
B-3	Centro	-	7,390	-	7,390
B-4	Jaen	550	2,470	440	3,470
B-5	Tacumbu	-	1,150	-	1,150
B-6	Salamanca	230	1,320	-	1,550
B-7	Zanja Moroti	710	1,580	310	2,610
B-8	Ferreira	820	3,140	850	4,810
B-9	Villa Universitaria	-	2,270	-	2,270
B-10	Las Mercedes	570	1,970	460	3,010
B-11	Mariscal Lopez	-	650	-	650
B-12	Bella Vista	-	750	-	750
B-13	Tablada	-	1,020	-	1,020
B-14	Mburicao	3,810	14,850	3,240	21,910
B-15	Ycua Carrillo	1,130	3,510	1,320	5,980
B-16	Santa Rosa	920	2,190	620	3,730
B-17	Tres Puentes Cue	2,540	2,480	-	5,020
B-18	Itay	21,290	34,440	8,280	64,020
B-19	Lambare	5,780	24,000	7,780	37,570
B-20	Valle Apua	-	8,330	-	8,330
B-21	Villa Elisa	1,000	8,090	-	9,090
B-22	Nemby	1,420	3,190	-	4,620
B-23	San Lorenzo	5,880	15,050	-	20,940
B-24	Tayazuape	3,930	5,780	-	9,710
B-26	Zeballos Cue	20	960	-	980
B-27	Paso Cai	660	3,680	-	4,340
	Total	51,260	154,100	23,300	228,760

表7－1 (1/3) 代替案の建設費 (マスター・プラン, 3年確率)

(Unit: ¢ Million)

Basin Number	Name of Basin or River	Case I-1	Case I-2/2	Case I-3/2
1.	Basins With River Channel			
B-2	Jardin	500	610	560
B-4	Jaen	2,560	2,870	2,730
B-6	Salamanca	1,260	1,400	1,340
B-7	Zanja Moroti	1,920	2,010	1,970
B-8	Ferreira	3,330	4,270	3,910
B-10	Las Mercedes	2,100	2,340	2,220
B-12	Bella Vista	620	730	700
B-14	Mburicao	16,220	18,900	17,330
B-15	Ycua Carrillo	4,030	4,720	4,500
B-16	Santa Rosa	2,650	3,510	3,110
B-17	Tres Puentes Cue	3,220	3,800	3,690
B-18	Itay	47,670	50,430	48,640
B-19	Lambare	26,050	35,090	31,320
B-21	Villa Elisa	7,300	10,780	9,750
B-22	Nemby	3,620	5,110	4,470
B-23	San Lorenzo	16,450	22,320	20,420
B-24	Tayazuape	7,470	13,490	11,920
B-26	Zeballos Cue	800	1,090	1,000
B-27	Paso Cai	3,470	5,790	5,080
	Sub-Total	151,240	189,260	174,660
2.	Basins Without River Channel/1			
B-1	Varadero	2,640	2,640	2,640
B-3	Centro	1,820	1,820	1,820
B-5	Tacumbu	940	940	940
B-9	Villa Universitaria	1,860	1,860	1,860
B-11	Mariscal Lopez	540	540	540
B-13	Tablada	840	840	840
B-20	Valle Apua	6,840	6,840	6,840
	Sub-Total	15,480	15,480	15,480
	Total	166,720	204,740	190,140

Note: /1 Only drainage facilities are applied to these basins in all the study cases, because the cost is absolutely less than that of the combination with detention facilities.

/2 Costs have been estimated on the assumption that the runoff discharge under the land use condition as of 1984 is confined by drainage system and the incremental discharge for future urbanization up to 2005 by detention facilities.

表7－1 (2/3) 代替案の建設費（マスター・プラン，3年確率）

(Unit: ¢ Million)

Basin Number	Name of Basin or River	Case II-1	Case II-2/2	Case II-3/2
1.	Basins With River Channel			
B-2	Jardin	60	60	60
B-4	Jaen	1,090	1,180	1,130
B-6	Salamanca	210	230	220
B-7	Zanja Moroti	650	660	660
B-8	Ferreira	1,840	2,020	1,960
B-10	Las Mercedes	390	500	460
B-12	Bella Vista	160	180	170
B-14	Mburicao	7,520	8,890	8,400
B-15	Ycua Carrillo	1,160	2,560	2,050
B-16	Santa Rosa	760	1,710	1,470
B-17	Tres Puentes Cue	1,260	2,220	1,870
B-18	Itay	21,790	25,060	23,730
B-19	Lambare	9,420	15,670	14,030
B-21	Villa Elisa	540	2,930	2,380
B-22	Nemby	840	2,070	1,760
B-23	San Lorenzo	3,540	7,550	7,320
B-24	Tayazuape	2,330	6,550	5,560
B-26	Zeballos Cue	10	240	180
B-27	Paso Cai	430	2,790	2,240
	Sub-Total	54,000	83,070	75,650
2.	Basins Without River Channel/1			
B-1	Varadero	520	520	520
B-3	Centro	-	-	-
B-5	Tacumbu	150	150	150
B-9	Villa Universitaria	20	20	20
B-11	Mariscal Lopez	250	250	250
B-13	Tablada	150	150	150
B-20	Valle Apua	-	-	-
	Sub-Total	1,090	1,090	1,090
	Total	55,090	84,160	76,740

Note: /1 Only drainage facilities are applied to these basins in all the study cases, because the cost is absolutely less than that of the combination with detention facilities.

/2 Costs have been estimated on the assumption that the runoff discharge under the land use condition as of 1984 is confined by drainage system and the incremental discharge for future urbanization up to 2005 by detention facilities.

表7－1 (3/3) 代替案の建設費（マスター・プラン，3年確率）

(Unit: ¢ Million)

Basin Number	Name of Basin or River	Case III-1	Case III-2/1	Case III-3/1
1. Basins With River Channel				
B-2	Jardin	-	-	-
B-4	Jaen	-	-	-
B-6	Salamanca	-	-	-
B-7	Zanja Moroti	-	-	-
B-8	Ferreira	-	-	-
B-10	Las Mercedes	20	160	110
B-12	Bella Vista	-	-	-
B-14	Mburicao	4,380	6,590	6,070
B-15	Ycua Carrillo	-	-	-
B-16	Santa Rosa	550	1,400	1,160
B-17	Tres Puentes Cue	-	-	-
B-18	Itay	12,630	18,840	17,310
B-19	Lambare	4,680	11,820	10,170
B-21	Villa Elisa	-	-	-
B-22	Nemby	-	-	-
B-23	San Lorenzo	-	-	-
B-24	Tayazuape	-	-	-
B-26	Zeballos Cue	-	-	-
B-27	Paso Cai	-	-	-
	Sub-Total	22,260	38,810	34,820
2. Basins Without River Channel				
B-1	Varadero	-	-	-
B-3	Centro	-	-	-
B-5	Tacumbu	-	-	-
B-9	Villa Universitaria	-	-	-
B-11	Mariscal Lopez	-	-	-
B-13	Tablada	-	-	-
B-20	Valle Apua	-	-	-
	Sub-Total	-	-	-
	Total	22,260	38,810	34,820

Note: /1 Costs have been estimated on the assumption that the runoff discharge under the land use condition as of 1984 is controlled by drainage system and the incremental discharge for future urbanization up to 2005 by detention facilities.

表7－2　代替案における必要用地、移転家屋
(マスター・プラン)

(Unit: m^2)

Basin Number	Name of Basin	Case I			Case II			Case III		
		I-1	I-2	I-3	II-1	II-2	II-3	III-1	III-2	III-3
Land Acquisition										
B-1	Varadero	-	-	-	-	-	-	-	-	-
B-2	Jardin	-	-	-	-	-	-	-	-	-
B-3	Centro	-	-	-	-	-	-	-	-	-
B-4	Jaen	4,200	3,000	3,000	3,300	3,000	3,000	3,000	3,000	3,000
B-5	Tacumbu	-	-	-	-	-	-	-	-	-
B-6	Salamanca	500	-	-	100	-	-	-	-	-
B-7	Zanja Moroti	7,200	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
B-8	Ferreira	14,600	13,800	13,800	14,000	13,800	13,800	13,800	13,800	13,800
B-9	Villa Universitaria	-	-	-	-	-	-	-	-	-
B-10	Las Mercedes	3,700	2,900	2,900	3,200	2,900	2,900	2,900	2,900	2,900
B-11	Mariscal Lopez	-	-	-	-	-	-	-	-	-
B-12	Bella Vista	-	-	-	-	-	-	-	-	-
B-13	Tablada	-	-	-	-	-	-	-	-	-
B-14	Mburicao	34,400	30,000	30,000	32,500	30,000	30,000	30,000	30,000	30,000
B-15	Ycua Carrillo	10,100	4,000	4,000	8,200	4,000	4,000	4,000	4,000	4,000
B-16	Santa Rosa	8,500	4,100	4,100	7,600	4,100	4,100	4,100	4,100	4,100
B-17	Tres Puentes Cue	2,100	-	-	1,200	-	-	-	-	-
B-18	Itay	276,300	217,900	217,900	246,900	217,900	217,900	217,900	217,900	217,900
B-19	Lambare	26,500	9,600	9,600	19,500	9,600	9,600	9,600	9,600	9,600
B-20	Valle Apua	-	-	-	-	-	-	-	-	-
B-21	Villa Elisa	50,900	42,200	42,200	47,000	42,200	42,200	42,200	42,200	42,200
B-22	Nemby	7,200	-	-	4,900	-	-	-	-	-
B-23	San Lorenzo	228,500	172,800	172,800	206,400	172,800	172,800	172,800	172,800	172,800
B-24	Tayazuape	116,500	62,900	62,900	91,700	62,900	62,900	62,900	62,900	62,900
B-26	Zeballos Cue	3,900	3,800	3,800	3,900	3,800	3,800	3,800	3,800	3,800
B-27	Paso Cai	52,800	41,200	41,200	50,100	41,200	41,200	41,200	41,200	41,200
	Total	847,900	592,700	592,700	747,500	592,700	592,700	592,700	592,700	592,700
House Evacuation										
B-1	Varadero	-	-	-	-	-	-	-	-	-
B-2	Jardin	-	-	-	-	-	-	-	-	-
B-3	Centro	-	-	-	-	-	-	-	-	-
B-4	Jaen	6	4	4	4	4	4	4	4	4
B-5	Tacumbu	-	-	-	-	-	-	-	-	-
B-6	Salamanca	-	-	-	-	-	-	-	-	-
B-7	Zanja Moroti	10	8	8	8	8	8	8	8	8
B-8	Ferreira	13	11	11	11	11	11	11	11	11
B-9	Villa Universitaria	-	-	-	-	-	-	-	-	-
B-10	Las Mercedes	9	7	7	8	7	7	7	7	7
B-11	Mariscal Lopez	-	-	-	-	-	-	-	-	-
B-12	Bella Vista	-	-	-	-	-	-	-	-	-
B-13	Tablada	-	-	-	-	-	-	-	-	-
B-14	Mburicao	26	18	18	23	18	18	18	18	18
B-15	Ycua Carrillo	17	10	10	15	10	10	10	10	10
B-16	Santa Rosa	12	6	6	11	6	6	6	6	6
B-17	Tres Puentes Cue	-	-	-	-	-	-	-	-	-
B-18	Itay	123	101	101	112	101	101	101	101	101
B-19	Lambare	33	21	21	28	21	21	21	21	21
B-20	Valle Apua	-	-	-	-	-	-	-	-	-
B-21	Villa Elisa	-	-	-	-	-	-	-	-	-
B-22	Nemby	-	-	-	-	-	-	-	-	-
B-23	San Lorenzo	-	-	-	-	-	-	-	-	-
B-24	Tayazuape	-	-	-	-	-	-	-	-	-
B-26	Zeballos Cue	-	-	-	-	-	-	-	-	-
B-27	Paso Cai	-	-	-	-	-	-	-	-	-
	Total	249	183	183	220	183	183	183	183	183

表7－3 (1/2) 計画流量 (マスター・プラン)

No. of Basin	Name of Basin	No. of Subbasin	Design Discharge (m^3/s)	Remarks
B-1	Varadero	-	-	No River
B-2	Jardin	-	15	
B-3	Centro	-	-	No River
B-4	Jaen	-	45	
B-5	Tacumbu	-	-	No River
B-6	Salamanca	-	20	
B-7	Zanja Moroti	1	15	
		2	25	
B-8	Ferreira	1	55	
		2	70	
B-9	Villa Universitaria	-	-	No River
B-10	Las Mercedes	-	35	
B-11	Mariscal Lopez	-	-	No River
B-12	Bella Vista	-	20	
B-13	Tablada	-	-	No River
B-14	Mburicao	1	65	
		2	80	
		3	55	
		4	150	
		5	25	
		6	190	
B-15	Ycua Carrillo	1	35	
		2	65	
B-16	Santa Rosa	-	50	
B-17	Tres Puentes Cue	-	60	

表7－3 (2/2) 計画流量（マスター・プラン）

No. of Basin	Name of Basin	No. of Subbasin	Design Discharge (m^3/s)	Remarks
B-18	Itay	1	190	
		2-1	210	
		2-2	110	
		3-1	30	
		3-2	30	
		4	60	
		5	65	
		6	390	Subbasins 8 to 10 are outside the Planning area
		7-1	95	
		7-2	35	
		7-3	25	
B-19	Lambare	1	70	
		2	45	
		3	200	
		4	250	
		5	80	
		6	110	
		7	330	
B-20	Valle Apua	-	-	No River
B-21	Villa Elisa	1	45	Subbasin 2 is outside the Planning Area
		3	120	
B-22	Nemby	1	60	Subbasins 2-5 are outside the Planning Area
B-23	San Lorenzo	1	130	
		2-1	160	
		2-2	45	
		2-3	230	
B-24	Tayazuape	1	95	Subbasin 2 is outside the Planning Area
		3	170	
B-26	Zeballos Cue	-	12	
B-27	Paso Cai	-	70	

表7－4　代替案年平均償却費（マスター・プラン）

(Unit: ¢ Million)

Study Case	Without Loan		With Loan	
	Total	Annual Average	Total	Annual Average
Case I-1	297,520	15,660	541,520	11,280
Case I-2	365,370	19,230	664,970	13,850
Case I-3	339,320	17,860	617,600	12,870
Case II-1	98,310	5,170	178,780	3,720
Case II-2	150,190	7,900	273,180	5,690
Case II-3	136,950	7,210	249,320	5,190
Case III-1	39,720	2,090	72,270	1,510
Case III-2	69,260	3,650	126,220	2,630
Case III-3	62,140	3,270	113,080	2,360

Note: The costs mentioned in the second and third subdivisions of each case have been estimated on the assumption that the present discharge is contolled by drainage system and the residual discharge by detention facilities.

Terms and conditions of loan are an annual interest rate of 4% and a repayment period of 30 years including a 10-year grace period.

表7－5 (1/2) 河川改修計画の概要（マスター・プラン）

Basin Number	Name of Basin	Subbasin Number	Type of River Channel /1	Length of River Channel Impv't. (km)	Required Width (m) River Width	Required Width (m) Maintenance Road	Required Width (m) Total	Remarks
B-2	Jardin	-	-	0	-	-	-	River improvement is not necessary
B-4	Jaen	-	B	1.9	7.7	2.0	9.7	
B-6	Salamanca	-	B	1.3	4.7	2.0	6.7	
B-7	Zanja Moroti	1	-	0	-	-	-	River improvement is not necessary
		2-1	-	0	-	-	-	-do-
		2-2	E	0.6	24.5	(6.0)/2	24.5	
B-8	Ferreira	1	-	0	-	-	-	River improvement is not necessary
		2-1	-	0	-	-	-	-do-
		2-2	E	0.7	33.7	(6.0)/2	33.7	
B-10	Las Mercedes	1	C	1.2	5.4	2.0	7.4	
		2	C	0.2	6.4	2.0	8.4	
	Total -			1.4				
B-12	Bella Vista	-	-	0	-	-	-	River improvement is not necessary
B-14	Mburicao	1	C	0.1	3.6	2.0	5.6	
		2	C	0.4	8.1	2.0	10.1	
		3	C	1.0	7.0	2.0	9.0	
		4	B	1.2	15.7	2.0	17.7	
		5	B	0.4	7.1	2.0	9.1	
		6	B	2.5	19.1	2.0	21.1	
	Total -			5.6				
B-15	Ycua Carrillo	1	B	0.7	6.4	2.0	8.4	
		2	B	1.2	10.1	2.0	12.1	
	Total -			1.9				
B-16	Santa Rosa	-	B	2.4	8.2	2.0	10.2	
B-17	Tres Puentes Cue	-	B	6.0	9.4	2.0	11.4	

Note:
/1 Type of Channel;
A : Channel Without Revetment
B : Channel With Revetment and Without Invert
C : Channel With Revetment and Invert
D : Box Culvert
E : Channel With Embankment
/2 The crown of the embankment will serve as maintenance road.

表7－5 (2/2) 河川改修計画の概要（マスター・プラン）

Basin Number	Name of Basin	Subbasin Number	Type of River /1 Channel	Length of River Channel Impv't. (km)	Required Width (m) River Width	Maintenance Road	Total	Remarks
B-18	Itay	1	D	2.5	14.1	-	14.1	
		2-1	B	2.2	17.4	1.0	18.4	
		2-2	A	1.2	26.6	4.0	30.6	
		3-1	B	2.7	9.8	2.0	11.8	
		3-2	B	2.3	7.6	4.0	11.6	
		4	B	0.5	5.1	2.0	7.1	
			B	1.0	9.1	4.0	13.1	
			A	1.2	22.2	4.0	26.2	
		5	B	1.7	10.0	4.0	14.0	
		6	A	3.5	40.5	4.0	44.5	
		7-1	A	2.7	21.0	4.0	25.0	
		7-2	A	2.3	16.0	4.0	20.0	
		7-3	A	1.4	13.0	4.0	17.0	
	Total -			25.5				
B-19	Lambare	1	C	0.8	7.8	2.0	9.8	
		2	C	0.6	6.6	2.0	8.6	
			D	0.8	8.0	-	8.0	
		3	B	0.9	12.6	4.0	16.6	
		4	B	2.7	14.4	4.0	18.4	
		5	-	0	-	-	-	River Improvement is not necessary
		6	-	0	-	-	-	-do-
		7	B	1.1	19.4	4.0	23.4	
	Total -			6.9				
B-21	Villa Elisa	1	A	1.6	15.8	4.0	19.8	
		3	A	1.8	24.3	4.0	28.3	
	Total -			3.4				
B-22	Nemby	1	A	3.5	18.1	4.0	22.1	
B-23	San Lorenzo	1	A	5.7	13.2	4.0	17.2	
		2-1	A	3.5	26.7	4.0	30.7	
		2-2	A	5.1	17.2	4.0	21.2	
		2-3	A	1.5	31.9	4.0	35.9	
	Total -			15.8				
B-24	Tayazuape	1	A	4.1	22.2	4.0	26.2	
		3	A	4.0	28.1	4.0	32.1	
	Total -			8.1				
B-26	Zeballos Cue	-	A	0.4	13.5	4.0	17.5	
B-27	Paso Cai	-	A	4.0	19.8	4.0	23.8	

表7－6 (1/2) 排水施設計画概要（マスター・プラン）

Name of River or Basin	Location No. /1	Drainage Area (ha)	Structural Type	Size /2 (m)	Length (m)
Varadero	1-1	51	Pipe	2.2	490
	1-2	30	-do-	1.6	1,170
Jardin	2-1	29	-do-	1.8	150
Jaen	4-1	34	-do-	1.8	510
	4-2	107	Box Culvert	2.5 x 2.0	710
Tacumbu	5-1	29	Pipe	1.6	550
Salamanca	6-1	48	-do-	2.2	100
Zanja Moroti	7-1	35	-do-	1.8	250
Ferreira	8-1	86	Box Culvert	2.0 x 2.0	800
	8-2	40	Pipe	2.0	620
	8-3	19	-do-	1.4	320
	8-4	49	-do-	2.2	600
	8-5	13	-do-	1.2	200
Villa Universitaria	9-1	11	-do-	1.0	130
Las Mercedes	10-1	10	-do-	1.0	150
Mariscal Lopez	11-1	44	-do-	2.0	730
Bella Vista	12-1	42	-do-	2.0	350
Tablada	13-1	39	-do-	2.0	400
Mburicao	14-1 /3	55	----	-	-
	14-2	205	Box Culvert	3.0 x 2.0	2,370
	14-3	27	Pipe	1.6	305
	14-4	14	-do-	1.2	100
	14-5	42	-do-	1.8	540
	14-6	102	-do-	2.5	1,310
	14-7	66	-do-	2.2	795
	14-8	75	-do-	2.2	310
	14-9	14	-do-	1.2	150
	14-10	38	-do-	1.8	180
	14-11	83	-do-	2.5	655
	14-12	26	-do-	1.6	560
	14-13	101	-do-	2.5	1,490
	14-14	27	-do-	1.6	545
Ycua Carrillo	15-1	145	Box Culvert	3.0 x 2.0	650
Santa Rosa	16-1	34	Pipe	1.8	320
	16-2	20	-do-	1.4	100
Tres Puentes Cue	17-1	51	-do-	2.2	420
Itay	18-1	234	Box Culvert	3.5 x 2.0	100
	18-2	231	-do-	3.5 x 2.0	1,675
	18-3	390	-do-	2.5 x 2.0	1,775
	18-4	24	Pipe	1.4	100
	18-5	11	Pipe	1.0	100
	18-6	39	Pipe	1.8	140
	18-7	139	Box Culvert	2.0 x 2.0	410
	18-8	94	Pipe	2.5	80
	18-9	187	Open Channel	3.0 x 2.0	2,395
	18-10	218	Open Channel	3.5 x 2.0	2,865

表7－6 (2/2) 排水施設計画概要（マスター・プラン）

Name of River or Basin	Location No. /1	Drainage Area (ha)	Structural Type	Size /2 (m)	Length (m)
Lambare	19-1	205	Box Culvert	2.0 x 2.0	580
	19-2	54	Pipe	2.2	340
	19-3	117	Box Culvert	2.5 x 2.0	130
	19-4	29	Pipe	1.6	250
	19-5	37	-do-	1.8	250
	19-6	62	-do-	2.2	1,000
	19-7	153	Box Culvert	3.0 x 2.0	200
	19-8	59	Pipe	2.2	250
	19-9	40	-do-	1.8	590
	19-10	54	-do-	2.2	920
	19-11	21	-do-	1.4	80
	19-12	133	Box Culvert	2.5 x 2.0	470
	19-13	202	Box Culvert	2.0 x 2.0	700
	19-14	37	Pipe	1.8	120

Note

/1 : Location of drainage facilities is shown in Fig. 7-2.

/2 : The first and second figures of Box Culvert and Open Channel types give the bottom width and the height, respectively.

/3 : Improvement works of Location No. 14-1 consist of only inlets.

表7－7 流出抑制施設計画の概要
(マスター・プラン)

River Basin	Storage Facilities in Public Compound (ha)	Infiltration Trench (km)
Mburicao	19	74
Itay	70	253
Lambare	59	234
Total	148	561

表7－8　洪水防御施設建設費

(マスター・プラン)

(Unit: ¢ Million)

Basin Number	Name of Basin or River	River	Drainage Facilities	Detention Facilities	Total
1. Sub-Projects for 1986-1995 Execution					
B-14	Mburicao	2,500	4,190	-	6,690
B-18	Itay (Upstream of Aviadores del Chaco Avenue)	10,430	4,420	-	14,850
B-19	Lambare	3,440	4,830	-	8,270
	Sub-Total	16,370	13,440	-	29,810
2. Sub-Projects for 1996-2005 Execution					
B-1	Varadero	-	520	-	520
B-2	Jardin	-	60	-	60
B-3	Centro	-	-		-
B-4	Jaen	410	680	-	1,090
B-5	Tacumbu	-	150	-	150
B-6	Salamanca	160	50	-	210
B-7	Zanja Moroti	560	90	-	650
B-8	Ferreira	730	1,110	-	1,840
B-9	Villa Universitaria	-	20	-	20
B-10	Las Mercedes	370	20	-	390
B-11	Mariscal Lopez	-	250	-	250
B-12	Bella Vista	-	160	-	160
B-13	Tablada	-	150	-	150
B-14	Mburicao	-	-	1,330	1,330
B-15	Ycua Carrillo	610	550	-	1,160
B-16	Santa Rosa	640	120	-	760
B-17	Tres Puentes Cue	1,050	210	-	1,260
B-18	Itay (Downstream of Aviadores del Chaco Avenue	3,530	-	4,680	8,210
B-19	Lambare	-	-	4,180	4,180
B-20	Valle Apua	-	-	-	-
B-21	Villa Elisa	540	-	-	540
B-22	Nemby	840	-	-	840
B-23	San Lorenzo	3,540	-	-	3,540
B-24	Tayazuape	2,330	-	-	2,330
B-26	Zeballos Cue	10	-	-	10
B-27	Paso Cai	430	-	-	430
	Sub-Total	15,750	4,140	10,190	30,080
	Total	32,120	17,580	10,190	59,890

表7－9　コルポサナ下水道事業の将来余剰資金

Unit: ¢ million

Year	Revenue /1	Expenditure /2			Surplus Fund	Accumulation
		Interest	Repayment	Total		
1987	720.9	108.3	271.5	379.8	341.1	341.1
1988	829.0	91.3	302.4	393.7	435.3	776.4
1989	953.4	65.2	302.4	367.6	585.8	1,362.2
1990	1,096.4	44.6	104.3	148.9	947.5	2,309.7
1991	1,151.2	41.7	104.3	146.0	1,005.2	3,314.9
1992	1,208.8	39.8	104.3	144.1	1,064.7	4,379.6
1993	1,269.2	35.9	104.3	140.2	1,129.0	5,508.6
1994	1,332.7	32.9	95.5	128.4	1,204.3	6,712.9
1995	1,399.3	30.6	82.7	113.3	1,286.0	7,998.9
1996	1,469.3	28.4	77.2	105.6	1,363.7	9,362.6
1997	1,542.8	26.4	77.2	103.6	1,439.2	10,801.8
1998	1,619.9	24.4	78.8	103.2	1,516.7	12,318.5
1999	1,700.9	22.6	61.9	84.5	1,616.4	13,934.9
2000	1,785.9	21.3	61.9	83.2	1,702.7	15,637.6
2001	1,875.2	20.1	61.9	82.0	1,793.2	17,430.8
2002	1,969.0	18.9	61.9	80.8	1,888.2	19,319.0
2003	2,067.5	17.6	61.9	79.5	1,988.0	21,307.0
2004	2,170.9	16.4	61.9	78.3	2,092.6	23,399.6
2005	2,279.4	15.2	61.9	77.1	2,202.3	25,601.9
2006	2,393.4	13.9	61.9	75.8	2,317.6	27,919.5
2007	2,513.1	12.7	61.9	74.6	2,438.5	30,358.0
2008	2,638.8	11.4	61.9	73.3	2,565.5	32,923.5
2009	2,770.7	10.2	61.9	72.1	2,698.6	35,622.1
2010	2,909.2	9.0	61.9	70.9	2,838.3	38,460.4
2011	3,054.7	7.7	61.9	69.6	2,985.1	41,445.5
2012	3,207.4	6.4	61.9	68.3	3,139.1	44,584.6
2013	3,367.8	5.3	61.9	67.2	3,300.6	47,885.2
2014	3,536.2	4.0	61.9	65.9	3,470.3	51,355.5
2015	3,713.0	2.8	61.9	64.7	3,648.3	55,003.8
2016	3,898.7	1.5	61.9	63.4	3,835.3	58,839.1
2017	4,093.6	0.3	30.9	31.2	4,062.4	62,901.5
2018	4,298.3	-	-	-	4,298.3	67,199.8
2019	4,513.2	-	-	-	4,513.2	71,713.0
2020	4,738.9	-	-	-	4,738.9	76,451.9
2021	4,738.9	-	-	-	4,738.9	81,190.8
2022	4,738.9	-	-	-	4,738.9	85,929.7
2023	4,738.9	-	-	-	4,738.9	90,668.6
2024	4,738.9	-	-	-	4,738.9	95,407.5
2025	4,738.9	-	-	-	4,738.9	100,146.4
2026	4,738.9	-	-	-	4,738.9	104,885.3
2027	4,738.9	-	-	-	4,738.9	109,624.2
2028	4,738.9	-	-	-	4,738.9	114,363.1
2029	4,738.9				4,738.9	119,102.0
2030	4,738.9				4,738.9	123,840.9
2031	4,738.9				4,738.9	128,579.8
2032	4,738.9				4,738.9	133,318.7
2033	4,738.9				4,738.9	138,057.6
2034	4,738.9				4,738.9	142,796.5

NOTE /1 : Annual inrease rates are assumed to be 15% until 1990, 5% from 1991 to 2020 and 0% after 2021.
/2 : Amotization for the loan of IDB, etc.

表８－１ (1/3) 代替案における流出量配分
(ファースト・ステイジ・プロジェクト)

Mburicao river 7.78 km (1-3S) to 8.07 km (B.P.)

Alternative Plan		Discharge to be Controlled (m3/s)
(Minimum Flow Capacity)		6
A-1	River	15
A-2	River	6
	Drainage	9

Mburicao river 5.18 km (4-1S) to 7.24 km (1-1S)

Alternative Plan		Discharge to be Controlled (m3/s)			
		1-1S to 1	1 to 2-1S	2-1S to 2	2 to 4-1S
(Minimum Flow Capacity)		43	24	30	100
B-1	River	60	75	80	130
B-2	River	24	35	39	-
	Drainage	36	40	41	-
B-3	River	-	-	73	110
	Draiange	-	-	7	20
B-4	River	-	-	74	111
	Drainage	-	-	6	19
B-2 and B-3	River.	24	35	32	110
	Drainage	36	40	48	20
B-2 and B-4	River	24	35	33	111
	Drainage	36	40	47	19

表8－1 (2/3) 代替案における流出量配分

(ファースト・ステイジ・プロジェクト)

San Martin river 0.83 km (3-1S) to 1.61 km (B.P.)

Alternative Plan		Discharge to be Controlled (m3/s)
(Minimum Flow Capacity)		14
C-1	River	35
C-2	River	23
	Drainage	22

Mburicao river 1.96 km to 2.53 km

Alternative Plan		Discharge to be Controlled (m3/s)
(Minimum Flow Capacity)		40
D-1	River	155
D-2	River (Short-cut)	155

Madame Lynch river 0.0 km (2-1) to 2.61 km (1-2-1S)

Alternative Plan		Discharge to be Controlled (m3/s)		
		2-1 to 2-1-1S	2-1-1S to 1-2	1-2 to 1-2-1S
(Minimum Flow Capacity)		9	19	15
E-1	River	170	155	155
E-2	River	30	20	5
	Diversion	-	-	155
E-3	River	15	-	-
	Diversion	155	-	-

表8－1 (3/3) 代替案における流出量配分
(ファースト・ステイジ・プロジェクト)

Itay river 0.32 km (2-2) to 1.38km (5)
Santa Teresa river 0.0 km (4-4) to 1.34 km (4-2)
San Pablo river 0.0 (4-3) to 0.67 km (B.P.)

Alternative Plan		Discharge to be Controlled.(m3/s)		
		Santa Teresa River 4-4 to 4-2	San Pablo River 4-3 to B.P.	Itay River 2-2 to 5
(Minimum Flow Capacity)		1	4	4
E-1	River	50	10	110
E-2	River	185	160	230
E-3	River	4-4 to 4-4-1s 185	-	230

Itay river 0.0 km (2-3) to 3.23 km (3-3)
Santa Teresa river 0.15 km(4-4) to 1.34 km (4-2)

Alternative Plan		Discharge to be Controlled (m3/s)			
		Itay River			Santa Teresa River
		2-3 to 2-2	2-2 to 5	5 to 3-3	4-4 to 4-2
(Minimum Flow Capacity)		85	4	1	1
F-1	River	250	110	65	50
F-2	River	230	90	65	30
F-3	River	240	100	50	50
F-2 & F-3	River	220	80	50	30

表8－2　代替案における家屋移転と建設費（ファースト・ステイジ・プロジェクト）

Alternative Plan	Cost (in million Guarani) River Channel	Diversion Channel	Retarding Basin	Drainage Facilities	Total	Land Acquisition (m^2)	House Evacuation (No.)
A-1	70	–	–	29	99	200	1
A-2	–	–	–	242	242	0	0
B-1	603	–	–	1,941	2,544	3,500	3
B-2	349	–	–	3,215	3,564	2,900	3
B-3	573	–	–	2,032	2,605	3,100	3
B-4	578	–	–	1,982	2,560	3,200	3
B-2 & B-3	321	–	–	3,306	3,627	1,800	3
B-2 & B-4	325	–	–	3,256	3,581	1,800	3
C-1	295	–	–	928	1,223	1,300	4
C-2	169	–	–	1,218	1,387	1,100	4
D-1	120	–	–	–	120	2,600	1
D-2	187	–	–	–	187	4,800	5
E-1	2,884	–	–	–	2,884	69,500	27
E-2	2,190	710	–	–	2,900	94,600	68
E-3	2,513	838	–	–	3,351	105,200	33
F-1	1,648	–	–	–	1,648	76,500	25
F-2	1,462	–	290	–	1,752	91,200	20
F-3	1,541	–	110	–	1,651	90,200	24
F-2 & F-3	1,348	–	400	–	1,748	104,900	20

表8－3 (1/2) 計画流量（ファースト・ステイジ・プロジェクト）

River	Reference Point		Section Length (m)	Design Discharge (m^3/s)
Mburicao River Basin				
Mburicao River	B.P.	to 1-3S	289	15
	1-3S	to 1-2S	191	20
	1-2S	to 1-1S	354	25
	1-1S	to 1	241	60
	1	to 2-1S	1,169	75
	2-1S	to 2	458	80
	2	to 4-1S	194	130
	4-1S	to 4	1,437	140
	4	to 6-1	1,527	155
	6-1	to 6-3	1,612	175
Sub-Total			7,472	
Jose Lombarde River	B.P.	to 6-2	802	11
Santo Domingo River	B.P.	to 5	1,130	25
San Martin River	B.P.	to 3-1S	779	35
	3-1S	to 3	857	50
Sub-Total			1,636	
Total (Mburicao River Basin)			11,040	
Itay River Basin				
Itay River	B.P.	to 3-1-1S	369	10
	3-1-1S	to 3-1	679	15
	3-1	to 3-3	952	35
	3-3	to 5	1,705	65
	5	to 2-2	1,203	110
	2-2	to 2-3	323	250
Sub-Total			5,231	
Orilla River	B.P.	to 3-2-1S	438	25
	3-2-1S	to 3-2	1,817	30
Sub-Total			2,255	

表8－3 (2/2) 計画流量（ファースト・ステイジ・プロジェクト）

River	Reference Point		Section Length (m)	Design Discharge (m^3/s)
Santa Teresa River	B.P.	to 4-1	482	15
	4-1	to 4-2	1,031	35
	4-2	to 4-4	1,189	50
Sub-Total			2,702	
San Pablo River	B.P.	to 4-3	670	10
Madame Lynch River	B.P.	to 1-1	211	75
	1-1	to 1-2	2,310	155
	1-2	to 2-1-1S	517	155
	2-1-1S	to 2-1	1,707	170
Sub-Total			4,745	
Total (Itay River Basin)			15,603	

表8－4 (1/3) 河道構造タイプの選定（ファースト・ステイジ・プロジェクト）

Reference Point		Design Discharge (m^3/s)	Improvement Length (m)	Construction Cost ($G10^6$)			Land Acquisition (m^2)			House Evacuation (No.)		
				Type A	Type B	Type C	Type A	Type B	Type C	Type A	Type B	Type C
Mburicao River												
B.P.	to 1-3S	15	90	100	79	70	800	400	250	0	2	1
1-3S	to 1-2S	20	0	-	-	-	-	-	-	-	-	-
1-2S	to 1-1S	25	0	-	-	-	-	-	-	-	-	-
1-1S	to 1	60	0	-	-	-	-	-	-	-	-	-
1	to 2-1S	75	98	251	213	189	1,200	800	600	4	0	0
2-1S	to 2	80	344	211	179	159	5,100	2,900	2,500	2	0	0
2	to 4-1S	130	126	277	255	265	1,500	400	200	7	3	3
4-1S	to 4	140	1,079	347	272	294	6,500	4,100	3,200	12	4	3
4	to 6-1	155	1,340	590	393	579	12,600	9,300	7,600	15	1	1
6-1	to 6-3	175	527	492	436	449	5,600	3,100	1,500	10	0	0
Sub-Total			3,604									
Jose Lombarde River												
B.P.	to 6-2	11	622	212	143	149	4,200	1,900	1,300	4	1	1
Santo Domingo River												
B.P.	to 5	25	355	234	172	181	2,400	1,300	700	4	1	1
San Martin River												
B.P.	to 3-1S	35	687	462	325	295	3,600	1,900	1,300	6	4	4
3-1S	to 3	50	355	415	292	265	4,100	2,200	1,500	4	2	2
Sub-Total			1,042									
Total		11,040	5,623									

Note; Type A : Excavated Channel without Revetment
Type B : Excavated Channel with Revetment without Invert
Type C : Excavated Channel with Revetment and Invert

表8－4 (2/3) 河道構造タイプの選定（ファースト・ステイジ・プロジェクト）

Reference Point	Design Discharge (m^3/s)	Improvement Length (m)	Construction Cost (₱10^6)			Land Acquisition (m^2)			House Evacuation (No.)		
			Type A	Type B	Type C	Type A	Type B	Type C	Type A	Type B	Type C
Itay River											
B.P. to 3-1-1S	10	369	29	25	28	2,400	1,400	1,000	5	0	0
3-1-1S to 3-1	15	679	163	127	140	5,700	3,300	1,800	7	0	0
3-1 to 3-3	35	952	228	223	230	3,900	1,200	900	10	0	0
3-3 to 5	65	1,705	854	692	835	24,000	14,400	9,800	21	5	4
5 to 2-2	110	1,203	346	465	526	25,300	11,500	8,500	9	5	5
2-2 to 2-3	250	323	202	223	235	13,300	6,600	4,700	0	0	0
Sub-Total		5,231									
Orilla River											
B.P. to 3-2-1S	25	438	129	114	117	4,300	1,600	1,300	5	2	2
3-2-1S to 3-2	30	1,817	472	411	429	17,800	6,200	5,200	7	4	4
Sub-Total		2,255									
Santa Teresa River											
B.P. to 4-1	15	482	160	108	115	3,100	1,500	1,100	8	1	1
4-1 to 4-2	35	1,031	476	417	425	15,100	8,800	6,800	8	6	5
4-2 to 4-4	50	1,189	408	489	508	23,000	12,700	10,300	11	7	6
Sub-Total		2,702									
San Pablo River											
B.P. to 4-3	10	670	128	102	104	3,100	1,500	1,200	3	0	0

Note; Type A : Excavated Channel without Revetment
Type B : Excavated Channel with Revetment without Invert
Type C : Excavated Channel with Revetment and Invert

表8－4 (3/3) 河道構造タイプの選定（ファースト・ステイジ・プロジェクト）

Reference Point	Design Discharge (m^3/s)	Improvement Length (m)	Construction Cost ($G10^6$)			Land Acquisition (m^2)			House Evacuation (No.)		
			Type A	Type B	Type C	Type A	Type B	Type C	Type A	Type B	Type C
Madame Lynch River											
B.P. to 1-1S	75	211	-	-	220 /1	-	-	700 /1	-	-	0 /1
1-1 to 1-2	155	2,310	-	-	4,900 /1	-	-	7,400 /1	-	-	15 /1
1-2 to 2-1-1S	155	517	421	384	411	9,800	3,200	1,600	7	0	0
2-1-1S to 2-1	170	1,707	1,087	850	892	32,700	14,300	7,800	15	7	7
Sub-Total		4,745									
		======									
Total		15,603									

Note; /1 : Figures are for Type D (Box Culvert).

表8－5　河道構造タイプ最適案（ファースト・ステイジ・プロジェクト）

River Name	Reference Point		Design Discharge (m^3/s)	Improvement Length (m)	Optimum Channel Type /1	Land Acquisition (m^2)	House Evacuation (No.)	Bridge (place)	Groundsill with Head (place)
Mburicao River Basin									
Mburicao	B.P.	to 1-3S	15	90	C	800	1	1	0
	1-3S	to 1-2S	20	0	- /2	-	-	0	0
	1-2S	to 1-1S	25	0	- /2	-	-	0	0
	1-1S	to 1	60	0	- /2	-	-	1	0
	1	to 2-1S	75	98	C	600	0	2	1
	2-1S	to 2	80	344	C	2,500	0	0	2
	2	to 4-1S	130	126	B	400	3	1	0
	4-1S	to 4	140	1,079	B	4,100	4	0	1
	4	to 6-1	155	1,340	B	9,300	1	1	2
	6-1	to 6-3	175	527	B	3,100	0	2	1
Sub-Total				3,604		20,800	9	8	7
Jose Lombarde	B.P.	to 6-2	11	622	B	1,900	1	2	2
Santo Domingo	B.P.	to 5	25	355	B	1,300	1	2	0
San Martin	B.P.	to 3-1S	35	687	C	1,300	4	4	2
	3-1S	to 3	50	355	C	1,500	2	0	1
Sub-Total				1,042		2,800	6	4	3
Total				5,623		26,800	17	16	12
Itay River Basin									
Itay	B.P.	to 3-1-1S	10	369	B	1,400	0	0	1
	3-1-1S	to 3-1	15	679	B	3,300	0	2	1
	3-1	to 3-3	35	952	B	1,200	0	3	4
	3-3	to 5	65	1,705	B	14,400	5	5	5
	5	to 2-2	110	1,203	A	25,300	9	0	0
	2-2	to 2-3	250	323	A	13,300	0	0	0
Sub-Total				5,231		58,900	14	10	11
Orilla	B.P.	to 3-2-1S	25	438	B	1,600	2	2	1
	3-2-1S	to 3-2	30	1,817	B	6,200	4	5	4
Sub-Total				2,255		7,800	6	7	5
Santa Teresa	B.P.	to 4-1	15	482	B	1,500	1	2	3
	4-1	to 4-2	35	1,031	B	8,800	6	3	3
	4-2	to 4-4	50	1,189	A	23,000	11	1	0
Sub-Total				2,702		33,300	18	6	6
San Pablo	B.P.	to 4-3	10	670	B	1,500	0	2	1
Madame Lynch	B.P.	to 1-1S	75	211	D	700	0	0	0
	1-1	to 1-2	155	2,310	D	7,400	15	0	0
	1-2	to 2-1-1S	155	517	B	3,200	0	3	0
	2-1-1S	to 2-1	170	1,707	B	14,300	7	4	4
Sub-total				4,745		25,600	22	7	4
Total				15,603		127,100	60	32	27
Grand Total				21,226		153,900	79	48	39

Note: /1 Channel Type; A : Channel Without Revetment
B : Channel With Revetment and Without Invert
C : Channel With Revetment and Invert
D : Box Culvert
E : Channel With Embankment

/2 River improvement is not necessary.

表8－6 (1/2) 排水施設構造最適案（ファースト・ステイジ・プロジェクト）

Location/1 No.	Section	Structural Type	Present Use	Reason for Adoption
Mburicao River Basin				
14-1 /2	-	-	Road	-
14-2	Whole Section	Underground Conduit	Road	No space for open channel; underground utilities existing.
14-3	-do-	-do-	Road	-do-
14-4	-do-	-do-	Road	-do-
14-5	-do-	-do-	Road	-do-
14-6	-do-	-do-	Road	-do-
14-7	-do-	-do-	Road	-do-
14-8	-do-	-do-	Road	-do-
14-9	-do-	-do-	Road	-do-
14-10	-do-	-do-	Road	-do-
14-11	-do-	-do-	Road	-do-
14-12	440m of Upper Section	-do-	Road	-do-
	120m of Lower Section	-do-	Open space	Economically justified.
14-13	Whole Section	-do-	Road	No space for open channel; underground utilities existing.
14-14	365m of Upper Section	-do-	Road	-do-
	180m of Lower Section	Open Channel	Existing channel	Sufficient open space available.

Note

/1 : The location of drainage facilities is shown in Fig. 8-12.
/2 : Improvement works of Location No. 14-1 consist of only inlets.

表8－6 (2/2) 排水施設構造最適案（ファースト・ステイジ・プロジェクト）

Location/1 No.	Section	Structural Type	Present Use	Reason for Adoption
Itay River Basin				
18-1	Whole Section	Underground Conduit	Road	No space for open channel.
18-2	190m of Upper Section	Open Channel	Existing channel	Sufficient open space available.
	1,485m of Lower Section	Underground Conduit	Road	No space for open channel.
18-3	915m of Upper and Middle Section	-do-	Road	-do-
	860m of Middle and Lower Section	Open Channel	Existing channel	Sufficient open space available.
18-4	Whole Section	Underground Conduit	Road	No space for open channel.
18-5	-do-	-do-	Road	-do-
18-6	-do-	-do-	Road	-do-
18-7	250m of Upper Section	Open Channel	Existing channel	Sufficient open space available.
	160m of Lower Section	Underground Conduit	Road	No space for open channel.
18-8	Whole Section	-do-	Road	-do-
18-9	-do-	Open Channel	Existing channel	Sufficient open space available.
18-10	-do-	-do-	Existing channel	-do-

表8－7 (1/2) 河川改修計画の概要（ファースト・ステイジ・プロジェクト）

River and Reference Point	Section Length (m)	Design Discharge (m3/s)	Structure Type	Dimension/1 (m)	Cross-sectional Type /2
Mbruricao river					
B.P. to 1-3S	289	15	channel with revetments and Invert	2.0 x 1.4	C
1-3S to 1-2S	191	20	no improvement	-	-
1-2S to 1-1S	354	25	no improvement	-	-
1-1S to 1	241	60	no improvement	-	-
1 to 2-1S	1,169	75	channel with revetments and invert	5.6 x 2.5	C
2-1S to 2	458	80	- ditto -	6.1 x 2.5	C
2 to 4-1S	194	130	channel with revetments	12.7 x 2.5	B
4-1S to 4	1,437	140	- ditto -	13.7 x 2.5	B
4 to 6-1	1,527	155	- ditto -	15.2 x 2.5	B
6-1 to 6-3	1,612	175	- ditto -	17.1 x 2.5	B
Jose Lombarde river					
B.P. to 6-2	802	11	- ditto -	3.3 x 1.0	B
Santo Domingo river					
B.P. to 5	1,130	25	- ditto -	5.6 x 1.1	B
San Martin river					
B.P. to 3-1S	779	35	channel with revetments and invert	4.5 x 1.6	C
3-1S to 3	847	50	- ditto -	5.3 x 1.8	C

NOTE /1 : Breadth x Height
/2 : Types B and C are drawn below.

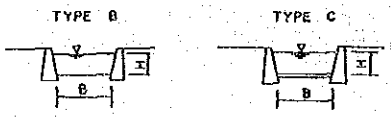

表８－７ (2/2) 河川改修計画の概要（ファースト・ステイジ・プロジェクト）

River and Reference Point	Section Length (m)	Design Discharge (m3/s)	Structure Type	Dimension/1 (m)	Cross-sectional Type/2
Itay river					
B.P. to 3-1-1S	369	10	channel with revetments	2.7 x 1.0	B
3-1-1S to 3-1	679	15	- ditto -	3.0 x 1.2	B
3-1 to 3-3	952	35	- ditto -	5.6 x 1.5	B
3-3 to 5	1,705	65	- ditto -	8.0 x 2.0	B
5 to 2-2	1,203	110	channel without protection	11.1 x 2.5	A
2-2 to 2-3	323	250	channel without revetments	45.5 x 2.5	A
Orilla river					
B.P. to 3-2-1S	438	25	- ditto -	5.1 x 1.3	B
3-2-1S to 3-2	1,817	30	- ditto -	6.0 x 1.3	B
Santa Teresa					
B.P. to 4-1-1S	482	15	- ditto -	3.6 x 1.0	B
4-1-1S to 4-2	1,032	35	- ditto -	7.4 x 1.5	B
4-2 to 4-4	1,189	50	channel without protection	9.2 x 2.0	A
San Pablo river					
B.P. to 4-3	670	10	channel with revetments	3.7 x 1.0	B
Madame Lynch river					
B.P. to 1-1-S	211	75	underground culvert	3.0 x 2.6 x 2 boxes	D(1)
1-1-S to 1-2	2,310	155	underground culvert	4.1 x 3.0 x 3 boxes	D(2)
1-2 to 2-1-1S	517	155	channel with revetments	12.4 x 3.0	B
2-1-1S to 2-1	1,707	170	- ditto -	13.7 x 3.0	B

NOTE /1 : Breadth x Height
/2 : Types A, B and D are drawn below.

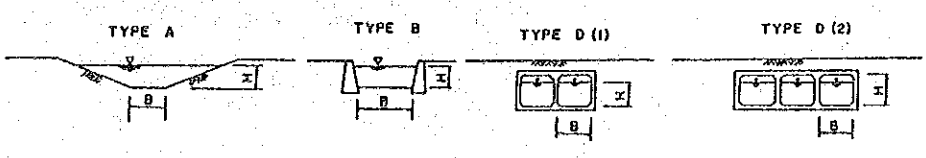

表８－８ (1/2) 計画排水施設の概要（ファースト・ステイジ・プロジェクト）

Location Number /1	Pipe No.	Drainage Area (ha)	Structural Type	Size /2 (m)	Length (m)
MBURICAO RIVER BASIN					
14-1 /3		55.0	-----	-	-
14-2	1	67.0	Pipe	2.2	350
	2	95.2	Box Culvert	2.0 x 2.0	175
	3	148.7	-do-	2.4 x 2.0	220
	4	162.7	-do-	2.6 x 2.0	260
	5	176.9	-do-	2.8 x 2.0	315
	6	192.4	-do-	3.0 x 2.0	365
	7	205.0	-do-	3.1 x 2.0	685
14-3	1	27.0	-do-	1.6	305
14-4	1	14.0	-do-	1.2	100
14-5	1	42.0	-do-	1.8	540
14-6	1	47.3	-do-	2.0	125
	2	64.1	-do-	2.2	285
	3	101.7	Box Culvert	2.0 x 2.0	370
	4	40.9	Pipe	1.8	305
	5	58.0	-do-	2.0	210
	6	124.0	Box Culvert	2.0 x 2.0	15
14-7	1	34.4	Pipe	1.8	225
	2	46.2	-do-	2.0	365
	3	66.0	-do-	2.2	205
14-8	1	63.9	-do-	2.0	205
	2	75.0	-do-	2.2	105
14-9	1	14.0	-do-	1.2	150
14-10	1	38.0	-do-	1.8	180
14-11	1	58.8	-do-	2.2	140
	2	83.0	Box Culvert	2.0 x 2.0	515
14-12	1	10.9	Pipe	1.0	440
	2	26.0	-do-	1.6	120
14-13	1	20.4	-do-	1.2	305
	2	41.4	-do-	1.8	300
	3	74.6	-do-	2.2	215
	4	86.7	Box Culvert	2.0 x 2.0	320
	5	101.0	Box Culvert	2.0 x 2.0	350
14-14	1	21.7	Pipe	1.4	365
	2	24.0	Open Channel	1.5 x 1.0	180

表8－8 (2/2) 計画排水施設の概要（ファースト・ステイジ・プロジェクト）

Location Number /1	Pipe No.	Drainage Area (ha)	Structural Type	Size /2 (m)	Length (m)
18-1	1	234.0	Box Culvert	2.5 x 1.4	100
18-2	1	83.0	Open Channel	2.5 x 2.0	190
	2	37.9	Pipe	1.8	100
	3	158.0	Box Culvert	2.5 x 2.0	640
	4	227.5	2-Box Culvert	1.8 x 2.0	505
	5	231.0	-do-	2.2 x 2.0	240
18-3	1	246.2	-do-	1.9 x 2.0	270
	2	250.1	Open Channel	4.2 x 2.0	90
	3	330.4	Open Channel	4.3 x 2.5	500
	4	385.7	2-Box Culvert	2.2 x 2.5	645
	5	390.0	Open Channel	4.9 x 2.5	270
18-4	1	24.0	Pipe	1.4	100
18-5	1	11.0	-do-	1.0	100
18-6	1	39.0	-do-	1.8	140
18-7	1	136.2	Open Channel	2.5 x 2.0	250
	2	139.0	Box Culvert	2.0 x 2.0	160
18-8	1	94.0	-do-	2.0 x 2.0	80
18-9	1	113.2	Open Channel	2.1 x 2.0	500
	2	137.9	-do-	2.5 x 2.0	450
	3	162.1	-do-	2.8 x 2.0	450
	4	182.1	-do-	3.1 x 2.0	675
	5	187.0	-do-	3.4 x 2.0	320
18-10	1	37.5	-do-	2.0 x 1.0	475
	2	108.0	-do-	2.2 x 2.0	455
	3	124.6	-do-	2.3 x 2.0	485
	4	149.4	-do-	2.9 x 2.0	135
	5	191.8	-do-	3.6 x 2.0	500
	6	218.0	-do-	4.0 x 2.0	425
	7	218.0	-do-	4.3 x 2.0	390

Note

/1 : Location of drainage facilities is shown in Fig. 8-12.

/2 : The first and second figures of Box Culvert and Open Channel types give the bottom width and the height, respectively.

/3 : Improvement works of Location No. 14-1 consist of only inlets.

表8－9　建設工事の構成要素
（ファースト・ステイジ・プロジェクト）

Component	Mburicao River Basin	Itay River Basin
A. Artigas Avenue	Construction of one bridge.	-
B. Espana Avenue	Construction of one bridge and two routes of drainage facilities.	Construction of one groundsill and two routes of drainage facilities.
C. Mariscal Lopez Avenue	Construction of one bridge and two routes of drainage facilities.	Construction of two bridges and one route of drainage facilities.
D. Ayala Avenue	Construction of two routes of drainage facilities.	Construction of three routes of drainage facilities.
E. Madame Lynch (I)	-	River improvements of Itay River (up to confluence with Madame Lynch River) and Madame Lynch River (up to Mariscal Lopex Avenue).
F. Madame Lynch River (II)	-	River improvement of Madame Lynch River (between Mariscal Lopez Avenue and Ayala Avenue).
G. River Channel (I)	River improvement of Mburicao River (between Artigas Avenue and Espana Avenue).	-
H. River Channel (II)	-	River improvements of Itay River (between confluence points with Madame Lynch River and Orilla River) and Orilla River (up to Ayala Avenue).
I. River Channel (III)	River improvement of Mburicao River (between Espana Avenue and Mariscal Lopez Avenue).	-
J. River Channel (IV)	River improvement of Mburicao River (between Mariscal Lopez Avenue and Ayala Avenue).	-
K. River Channel (V)	River improvement of three tributaries and construction of three routes of drainage facilities.	River improvement of four tributaries and construction of four routes of drainage facilities.
L. Drainage Facilities	Construction of five routes of drainage facilities.	-
M. Retarding Basin	-	Construction of retarding basin.

表8－10　建設工事構成要素変更による便益及び費用

Order of Priority	Construction Component	Accumulated Cost (G10^6)	Accumulated Benefit (G10^6)
CASE 1	(Based on Economic Consideration)		
1	C. Mariscal Lopez Avenue	559	310
2	A. Artigas Avenue	655	342
3	B. Espana Avenue	2,353	688
4	M. Retarding Basin	2,859	688
5	E. Madame Lynch Avenue (I)	6,642	1,070
6	F. Madame Lynch Avenue (II)	8,130	1,293
7	G. River Channel (I)	8,986	1,327
8	I. River Channel (III)	9,114	1,331
9	J. River Channel (IV)	9,222	1,363
10	D. Ayala Avenue	12,106	1,693
11	H. River Channel (II)	12,904	1,801
12	K. River Channel (V)	15,896	2,016
13	L. Drainage Facilities	16,197	2,108
CASE 2	(Based on Technical Consideration)		
1	A. Artigas Avenue	96	33
2	G. River Channel (I)	956	67
3	M. Retarding Basin	1,461	67
4	B. Espana Avenue	3,159	412
5	E. Madame Lynch Avenue (I)	6,943	794
6	H. River Channel (II)	7,734	902
7	I. River Channel (III)	7,862	906
8	C. Mariscal Lopez Avenue	8,421	1,216
9	F. Madame Lynch Avenue (II)	9,905	1,439
10	J. River Channel (IV)	10,013	1,471
11	D. Ayala Avenue	12,904	1,801
12	K. River Channel (V)	15,896	2,016
13	L. Drainage Facilities	16,197	2,108

表 8－11　計画洪水防御施設の事業費（ファースト・ステイジ・プロジェクト）

(Unit: ¢ thousand)

Work Item	Unit	Quantity/1	F.C.	L.C.	Total
1. Civil Works					
River Improvement Works					
- Excavation	m3	947,600	395,140	163,008	558,148
- Backfilling of Earth	m3	71,900	10,425	77,787	88,212
- Embankment	m3	27,100	6,475	1,449	7,924
- Spoil	m3	848,600	510,692	101,286	611,978
- Revetment	m3	65,600	615,453	1,047,413	1.662,866
- Gravel Backfilling for Revetment	m3	36,690	97,098	139,683	236,781
- Invert	m3	2,470	23,057	36,123	59,180
- Box Culvert	m	2,663	2,733,760	1,258,663	3,992,423
- Groundsill	pc.	39	10,524	12,690	23,214
- Bridge	pc.	48	689,187	267,416	956,603
- Sodding	m2	28,200	-	37,749	37,749
- Maintenance Road	m2	37,950	19,809	42,117	61,926
Sub-Total			5,111,620	3,185,385	8,297,005
Drainage Facilities					
- Excavation	m3	300,700	147,229	252,959	400,188
- Backfilling of Earth	m3	116,600	43,288	109,920	153,208
- Spoil	m3	184,100	110,781	21,972	132,753
- Box Culvert	m	6,230	1,475,932	722,789	2,198,721
- Piping	m	5,980	475,231	262,598	737,829
- Open Channel	m	6,740	546,802	657,944	1,204,746
- Manhole	pc.	124	48,682	30,163	78,845
- Inlet (Independent Type)	pc.	278	457,403	356,486	813,889
- Inlet (Continuous Type)	m	3,550	157,808	113,336	271,144
- Outlet	pc.	24	10,096	16,953	27,049
- Restoration of Pavement	m2	55,170	306,871	12,002	426,873
Sub-Total			3,780,123	2,665,122	6,445,245
Total of 1			8,891,743	5,850,507	14,742,250
2. Compensation					
House Evacuation	pc.	77	-	568,800	568,800
Land Acquisition	m2	163,800	-	885,946	885,946
3. Engineering Services	l.s.		3,022,000	342,200	3,364,200
Total of 1, 2 and 3			11,913,743	7,647,453	19,561,196
4. Physical Contingency (10% of Total of 1 to 3)	l.s		1,191,374	764,745	1,956,119
Total of 1 to 4			13,105,117	8,412,198	21,517,315
5. Price Contingency (None for F.C.; 10% for L.C.)	l.s		-	5,985,140	5,985,140
Grand Total			13,105,117	14,397,338	27,502,455

Note: The quantities of relative improvement works to secure the transportation alone the Artigas Avenue are also included.

表8－12　年度別事業費計画

（ファースト・ステイジ・プロジェクト）

(Unit: ¢ million)

Item	1988		1989		1990		1991		1992		1993		Grand Total		
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	Total
1. River Improvement Works	–	–	–	–	567	253	3,228	1,686	652	653	665	593	5,112	3,185	8,297
2. Drainage Facility Works	–	–	–	–	1,080	959	–	–	1,802	1,084	898	623	3,780	2,665	6,445
3. House Evacuation	–	–	–	–	–	–	–	158	–	173	–	238	–	569	569
4. Land Acquisition	–	–	–	–	–	–	–	198	–	411	–	277	–	886	886
5. Engineering Services	467	52	467	52	522	60	522	60	522	60	522	60	3,022	342	3,364
Total of 1 to 5	467	52	467	52	2,169	1,271	3,750	2,103	2,975	2,380	2,085	1,790	11,914	7,647	19,561
6. Physical Contingency (10% of Total of 1 to 5)	47	5	47	5	217	127	375	210	298	238	209	179	1,191	765	1,956
Total of 1 to 6	514	57	514	57	2,386	1,399	4,125	2,313	3,273	2,618	2,294	1,968	13,105	14,397	21,517
7. Price Contingency (None for F.C.; 10% for L.C.)	–	12	–	19	–	649	–	1,413	–	2,021	–	1,871	–	5,985	5,985
Total	514	69	514	76	2,386	2,047	4,125	3,726	3,273	4,639	2,294	3,840	13,105	14,397	27,502

表8－13　費用／便益関係（ファースト・ステイジ・プロジェクト）

Unit: ₡ million

Year	Economic Cost				Benefit
	Consulting Services	Construction	Operation & Maintenance	Total	
1	571	-	-	571	-
2	571	-	-	571	-
3	640	2,673	-	3,313	-
4	640	4,595	14	5,249	688
5	640	3,918	38	4,596	1,293
6	640	2,598	58	3,296	1,801
7	-	-	71	71	2,108
8	-	-	71	71	2,108
9	-	-	71	71	2,108
10	-	-	71	71	2,108
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41	-	-	71	71	2,108
42	-	-	71	71	2,108
43	-	-	71	71	2,108
44	-	-	71	71	2,108
45	-	-	71	71	2,108
46	-	-	71	71	2,108
47	-	-	71	71	2,108
48	-	-	71	71	2,108
49	-	-	71	71	2,108
50	-	-	71	71	2,108
Total	3,702	13,784	3,234	20,720	96,534

表8－14　コルポサナ下水道部門の財務予測

Unit: ¢ million

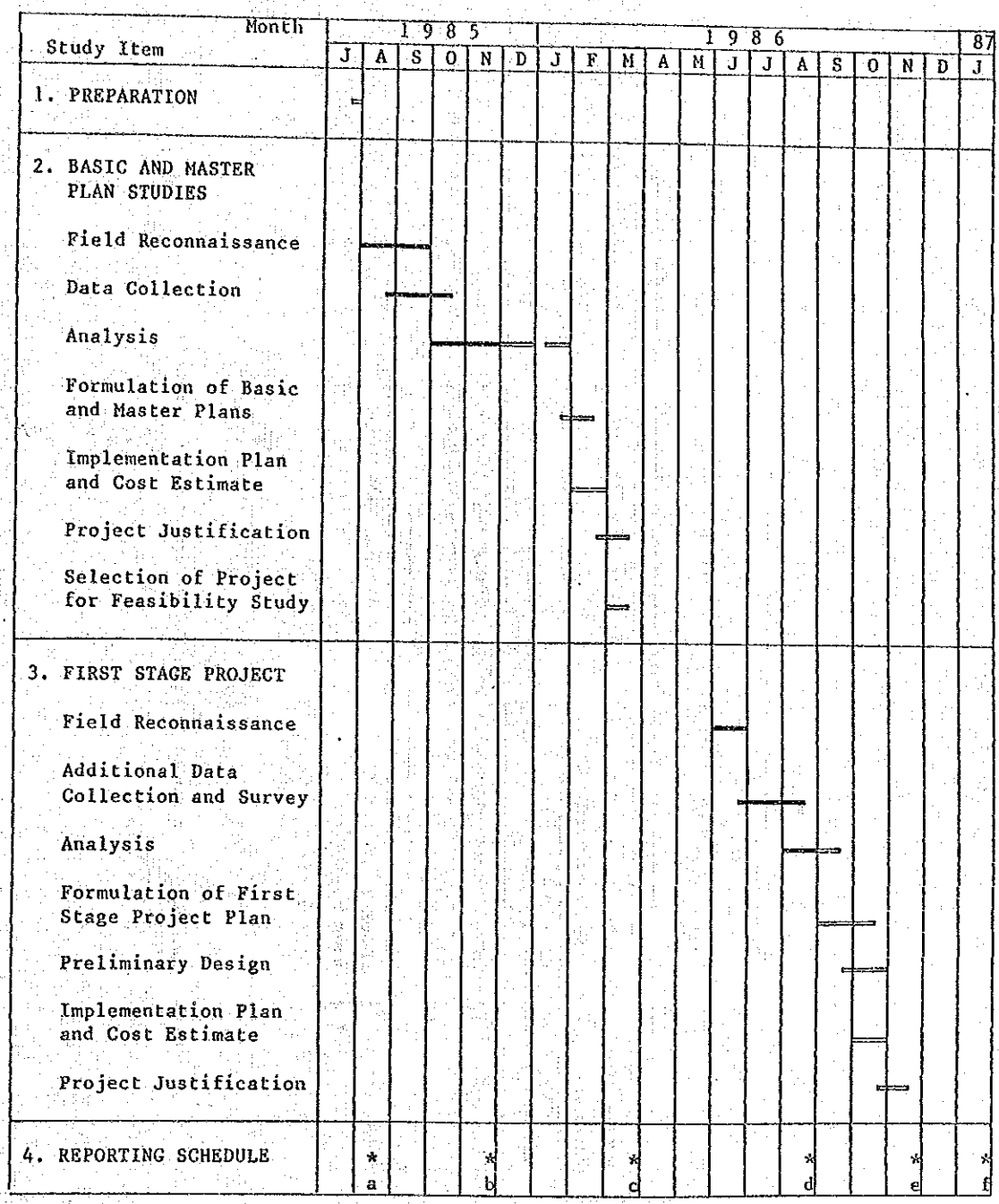
Year	Surplus Fund /1	Expenditure For The First Stage Project				Balance
		F.C. /2	L.C. /3	O/M /4	TOTAL	
1987	341.1	-	-	-	.0	341.1
1988	435.3	18.0	69.2	-	87.2	348.1
1989	585.8	36.0	76.1	-	112.1	473.7
1990	947.5	119.5	2,047.5	-	2,167.0	-1,219.5
1991	1,005.2	263.9	3,726.2	42.8	4,032.9	-3,027.7
1992	1,064.7	378.4	4,638.8	49.6	5,066.8	-4,002.1
1993	1,129.0	458.7	3,839.6	71.2	4,369.5	-3,240.5
1994	1,204.3	458.7	-	83.1	541.8	662.5
1995	1,286.0	458.7	-	87.3	546.0	740.0
1996	1,363.7	458.7	-	91.7	550.4	813.3
1997	1,439.2	458.7	-	96.3	555.0	884.2
1998	1,516.7	484.4	-	101.1	585.5	931.2
1999	1,616.4	509.2	-	106.2	615.4	1,001.0
2000	1,702.7	626.7	-	111.5	738.2	964.5
2001	1,793.2	827.0	-	117.1	944.1	849.1
2002	1,888.2	977.4	-	123.0	1,100.4	787.8
2003	1,988.0	1,073.2	-	129.2	1,202.4	785.6
2004	2,092.6	1,050.3	-	135.7	1,186.0	906.6
2005	2,202.3	1,027.4	-	142.5	1,169.9	1,032.4
2006	2,317.6	1,004.4	-	149.6	1,154.0	1,163.6
2007	2,438.5	981.5	-	157.1	1,138.6	1,299.9
2008	2,565.5	958.5	-	165.0	1,123.5	1,442.0
2009	2,698.6	935.6	-	173.3	1,108.9	1,589.7
2010	2,838.3	912.7	-	182.0	1,094.7	1,743.6
2011	2,985.1	889.7	-	191.1	1,080.8	1,904.3
2012	3,139.1	866.8	-	200.7	1,067.5	2,071.6
2013	3,300.6	843.9	-	210.7	1,054.6	2,246.0
2014	3,470.3	820.9	-	221.2	1,042.1	2,428.2
2015	3,648.3	798.0	-	232.3	1,030.3	2,618.0
2016	3,835.3	775.1	-	243.9	1,019.0	2,816.3
2017	4,062.4	752.1	-	256.1	1,008.2	3,054.2
2018	4,298.3	703.5	-	268.9	972.4	3,325.9
2019	4,513.2	655.8	-	282.3	938.1	3,575.1
2020	4,738.9	515.3	-	296.4	811.7	3,927.2
2021	4,738.9	292.1	-	311.2	603.3	4,135.6
2022	4,738.9	118.7	-	326.8	445.5	4,293.4
TOTAL	85,929.7	22,509.5	14,397.4	5,356.9	42,263.8	43,665.9

Note /1: Refer to Table 7-9.
/2: Amortization for the foreign currency portion.
/3: Expenses in the local currency portion.
/4: Operation and maintenance cost.

表9－1　行動計画

Time Range	Authority in Charge		
	Coordinating Committee	CORPOSANA	Other Agencies Concerned
Current Situation	Preparation Stage	° Management of storm water drainage system. ° Taxation to beneficiaries.	° Project execution related to the storm water drainage system.
Short Term Plan	° Mobilization of Coordinating Committee. ° Recognition and coordination of the problems on storm water drainage system among the agencies concerned. ° Coordinating development projects related to storm water drainage system. ° Publication of flood risk map and limitation of land use.	° Consolidation of the organization. ° Land acquisition for First Stage Project. ° Execution of First Stage Project. ° Delineation of the stretch and area to be managed. ° Collection of flood data and preparation of flood risk map.	° Recognition of the importance of the storm water drainage system. ° Modification of the ongoing projects related to the storm water drainage system. ° Strengthening of the capacity for garbage collection and of inspection for illegal dumping of garbage.
Long Term Plan	° Coordination on the installation of the storm water drainage system. ° Instructions on the development of flood-prone area and the flood risk area.	° Land acquisition for the Master Plan. ° Execution of the Master Plan. ° Increment of the government subsidies for storm water drainage system and taxation to beneficiaries.	° Preparation of necessary regulations for land development. ° Approval of land development in coordination with the storm water drainage project.

FIGURES



LEGEND: ▬▬ : Study in Project Site
═══ : Study in Japan
* : Submittal of Report

a : Inception Report
b : Progress Report (I)
c : Interim Report
d : Progress Report (II)
e : Draft Final Report
f : Final Report

図1－1 調査工程

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

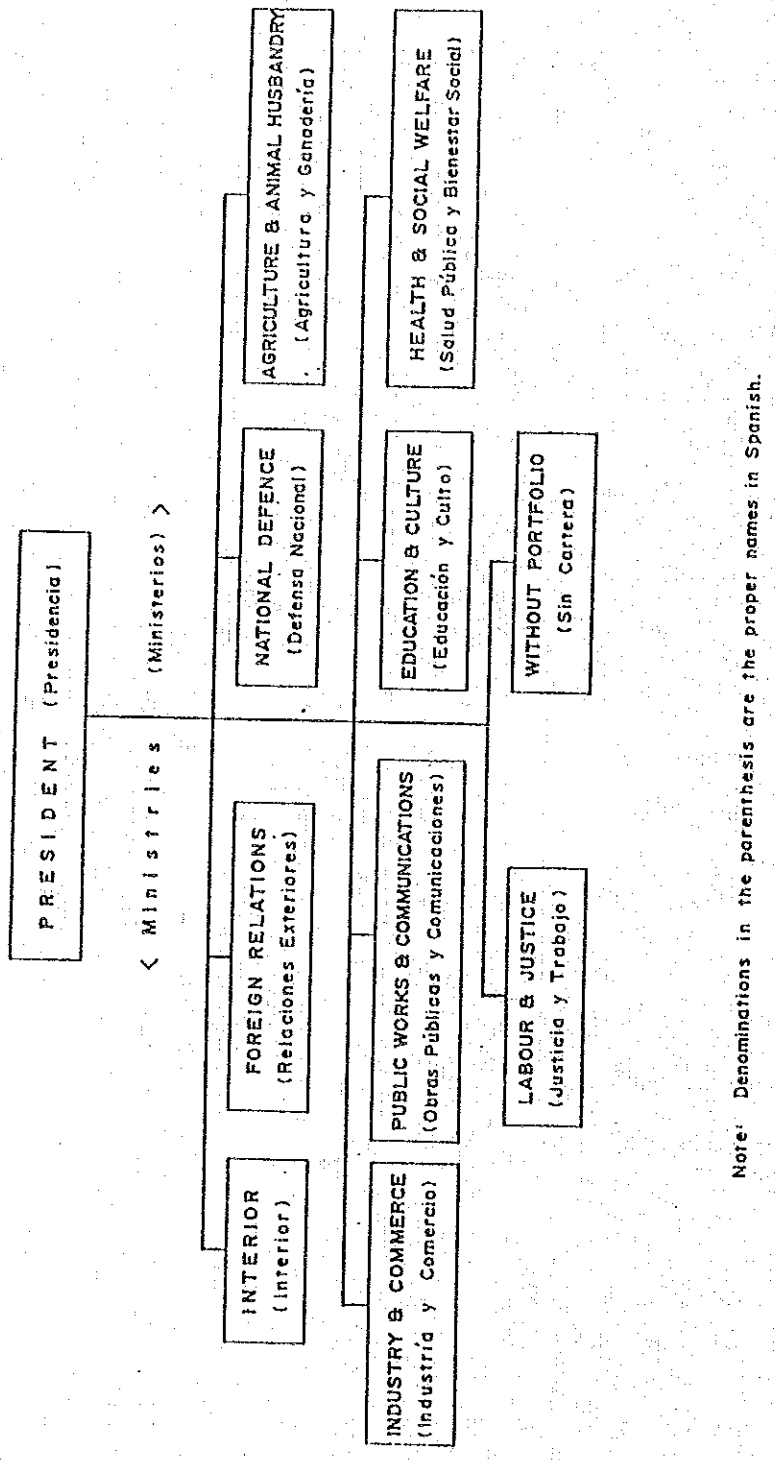


図2－1　パラグァイ国組織図

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

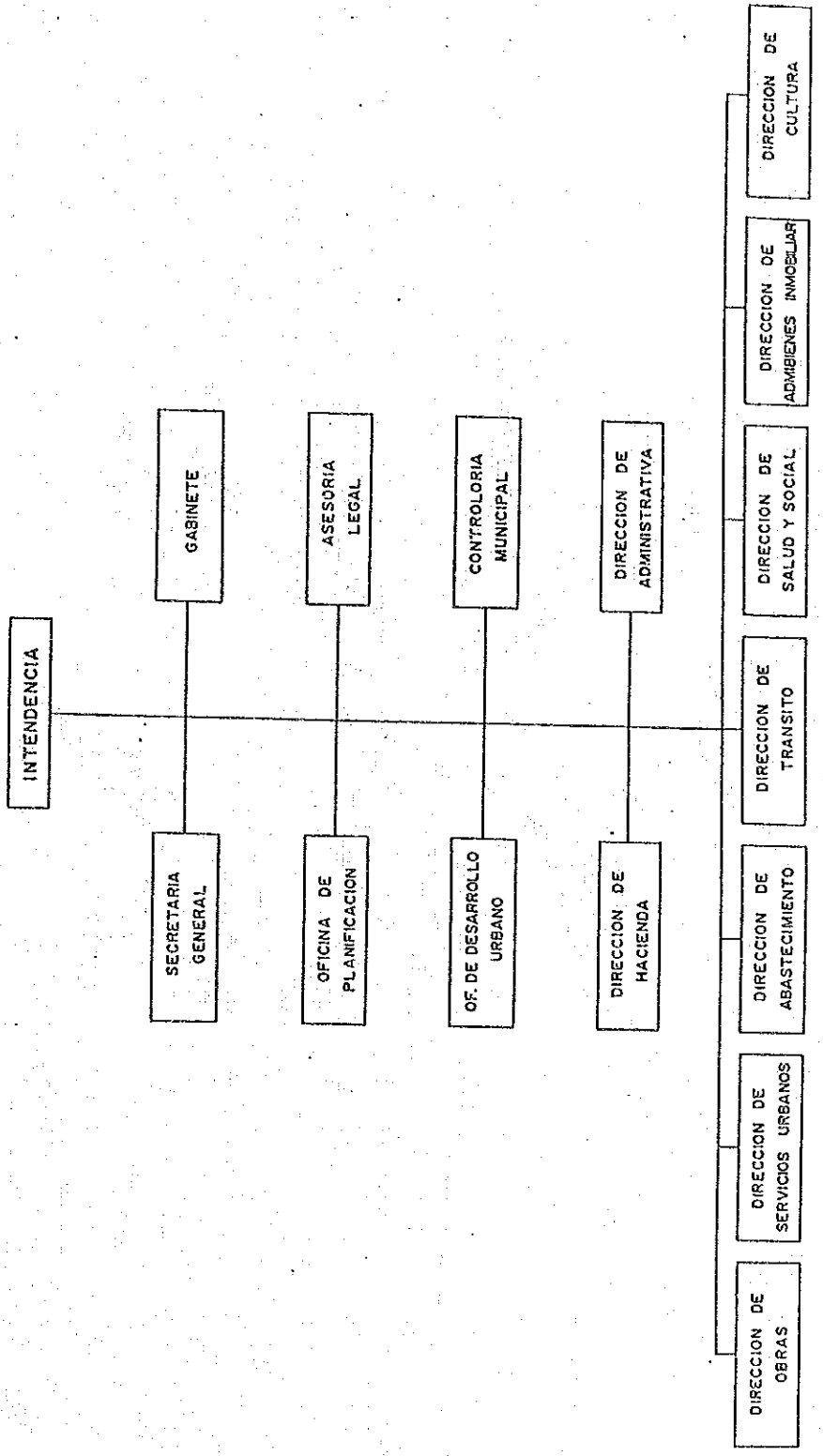


図2－2　アスンシオン首都圏組織図

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

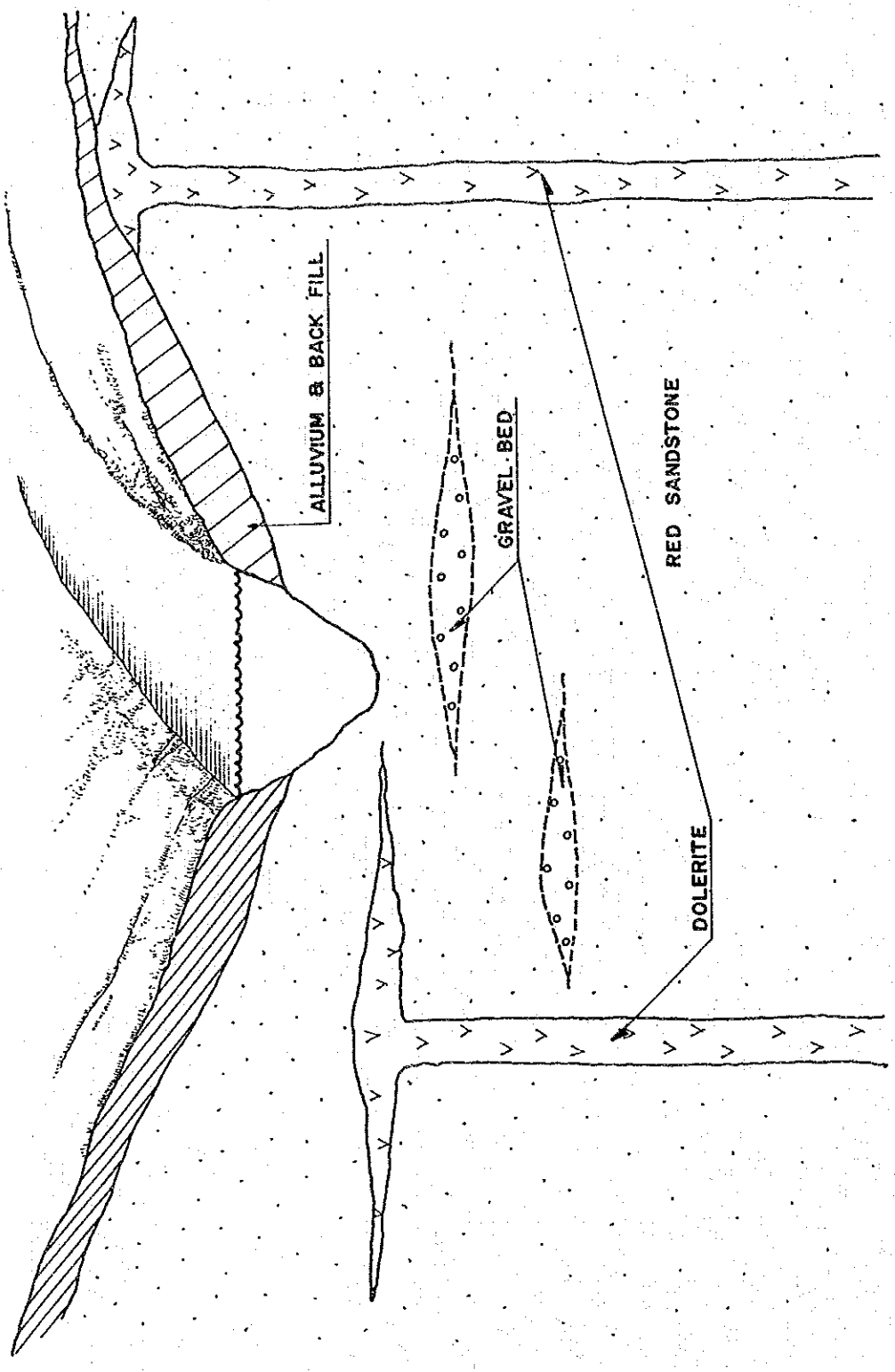


図２－３　調査対象域の地質模式図

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY
JAPAN INTERNATIONAL COOPERATION AGENCY

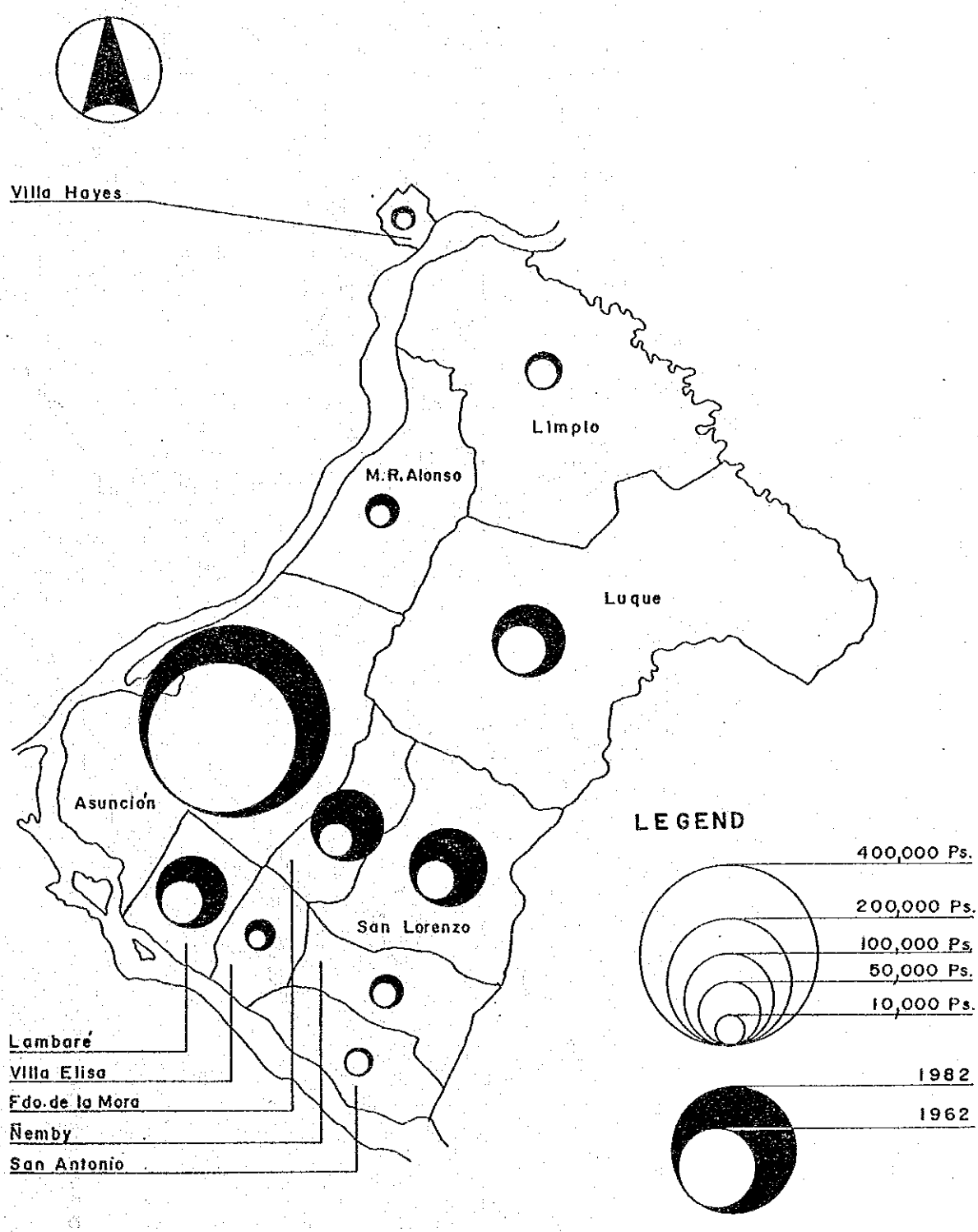


図２－４　首都圏の人口増加

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

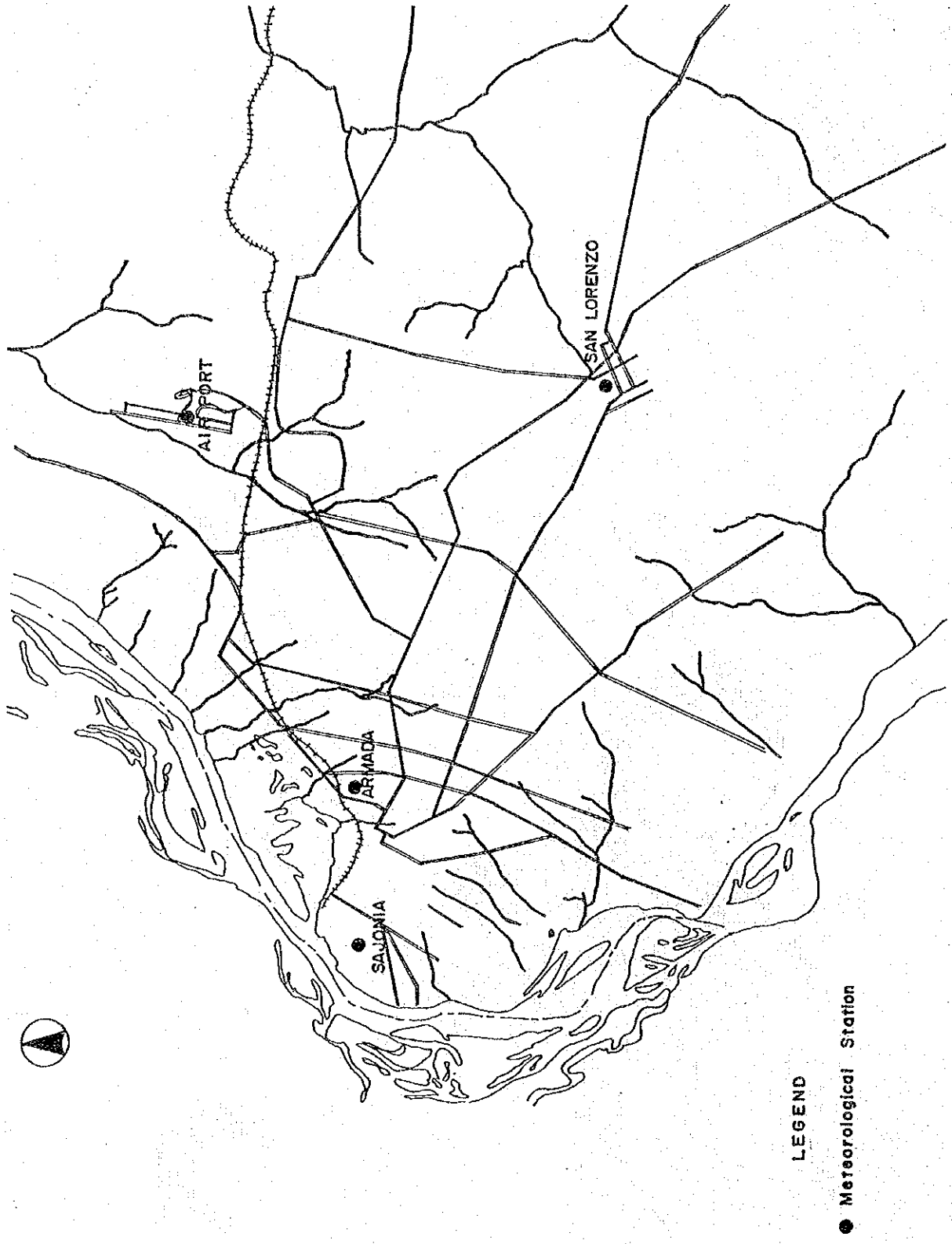


図２－５　気象観測所位置

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

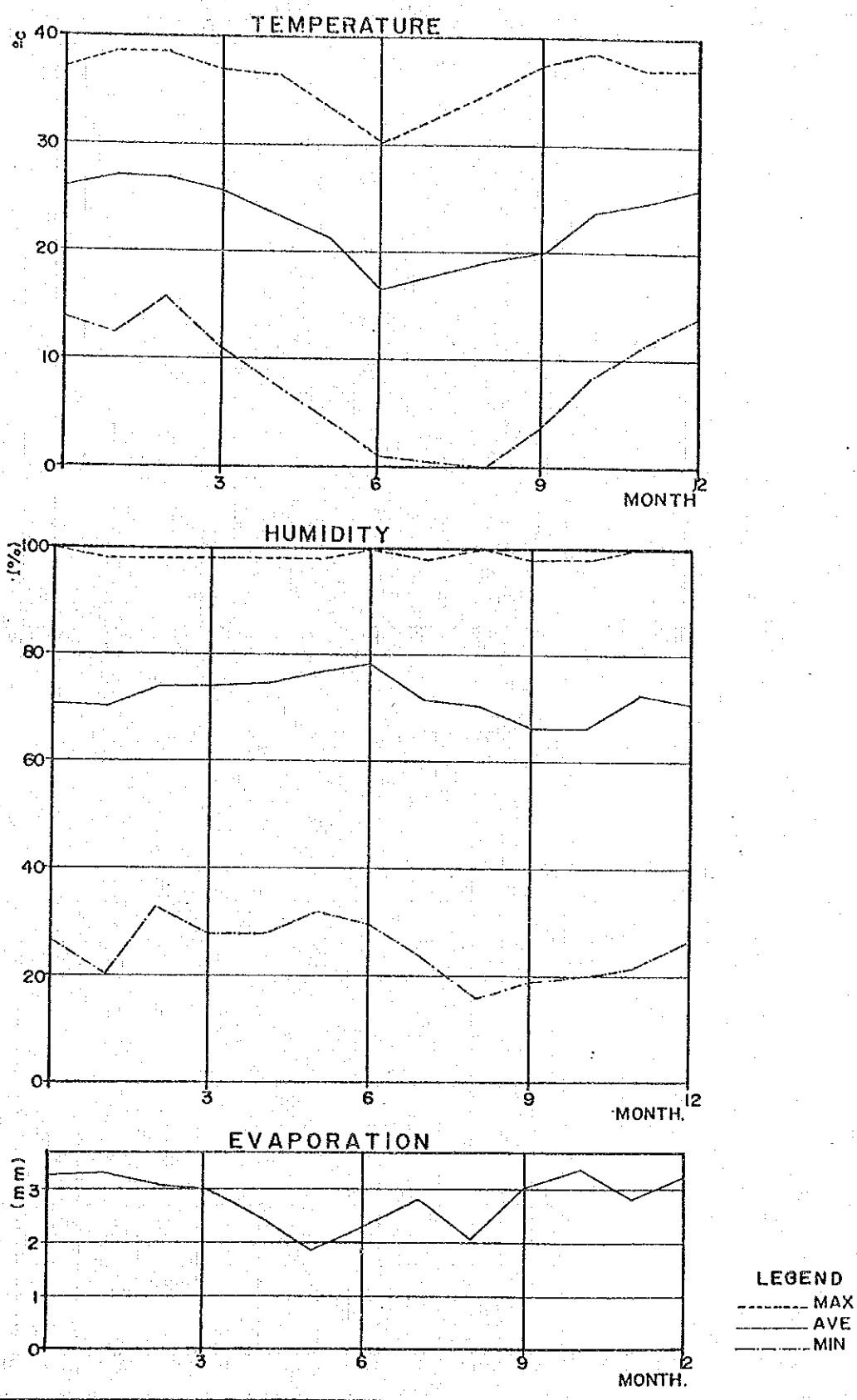
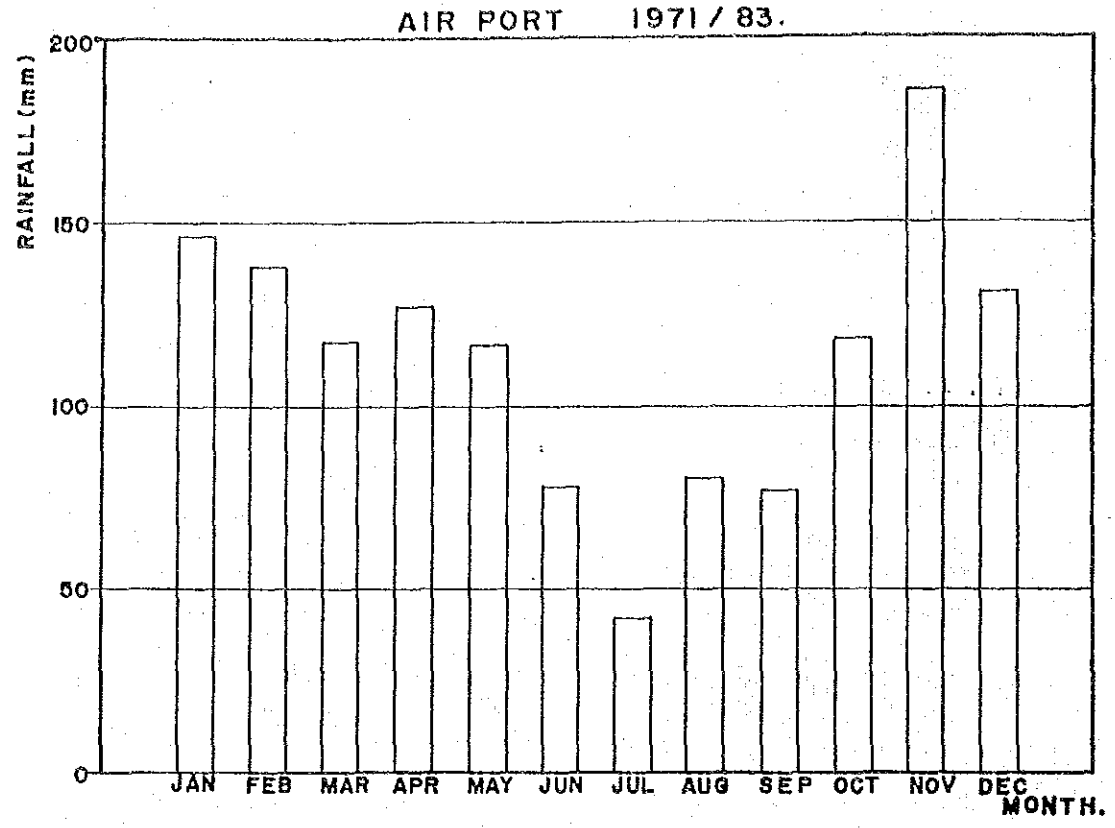


図2－6　気温、湿度及び蒸発散

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY



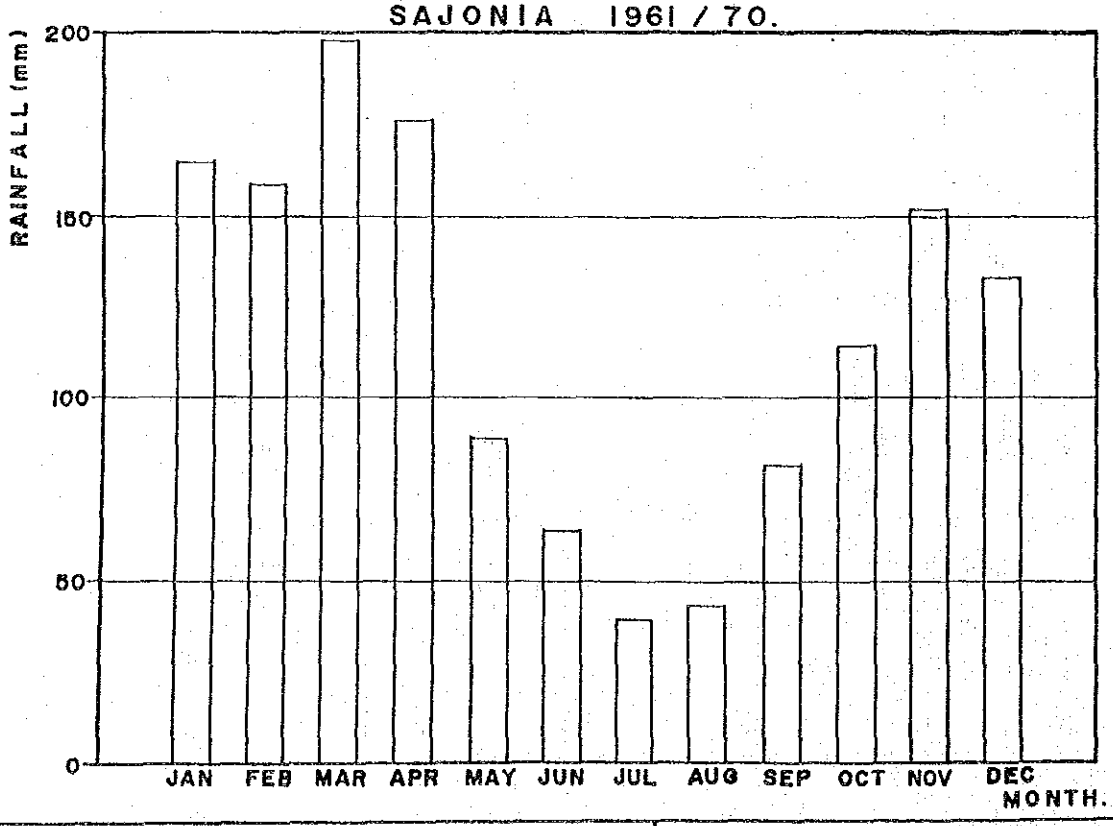


図2－7　月平均降雨量

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY
JAPAN INTERNATIONAL COOPERATION AGENCY

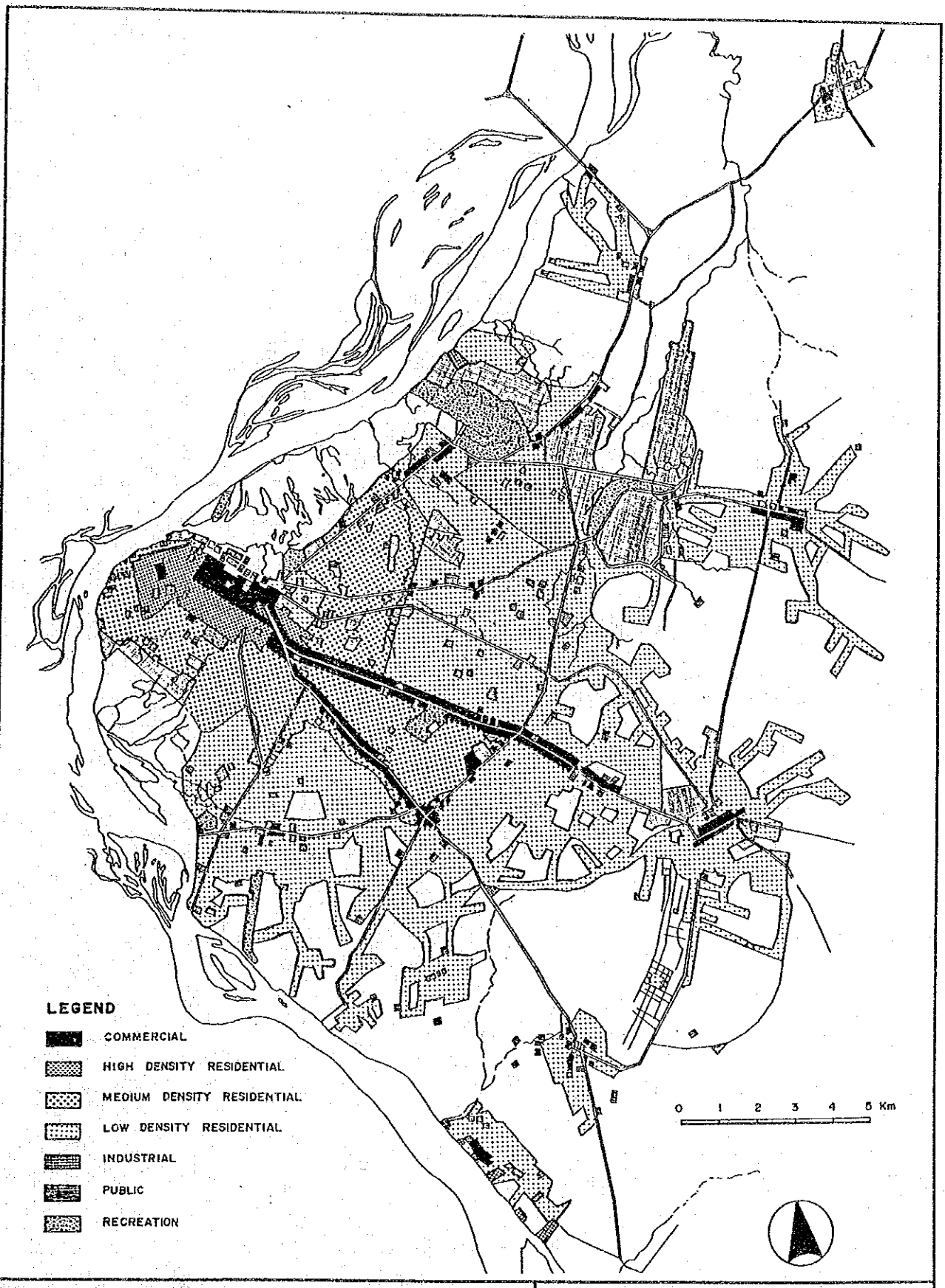


図２－８　現況土地利用

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

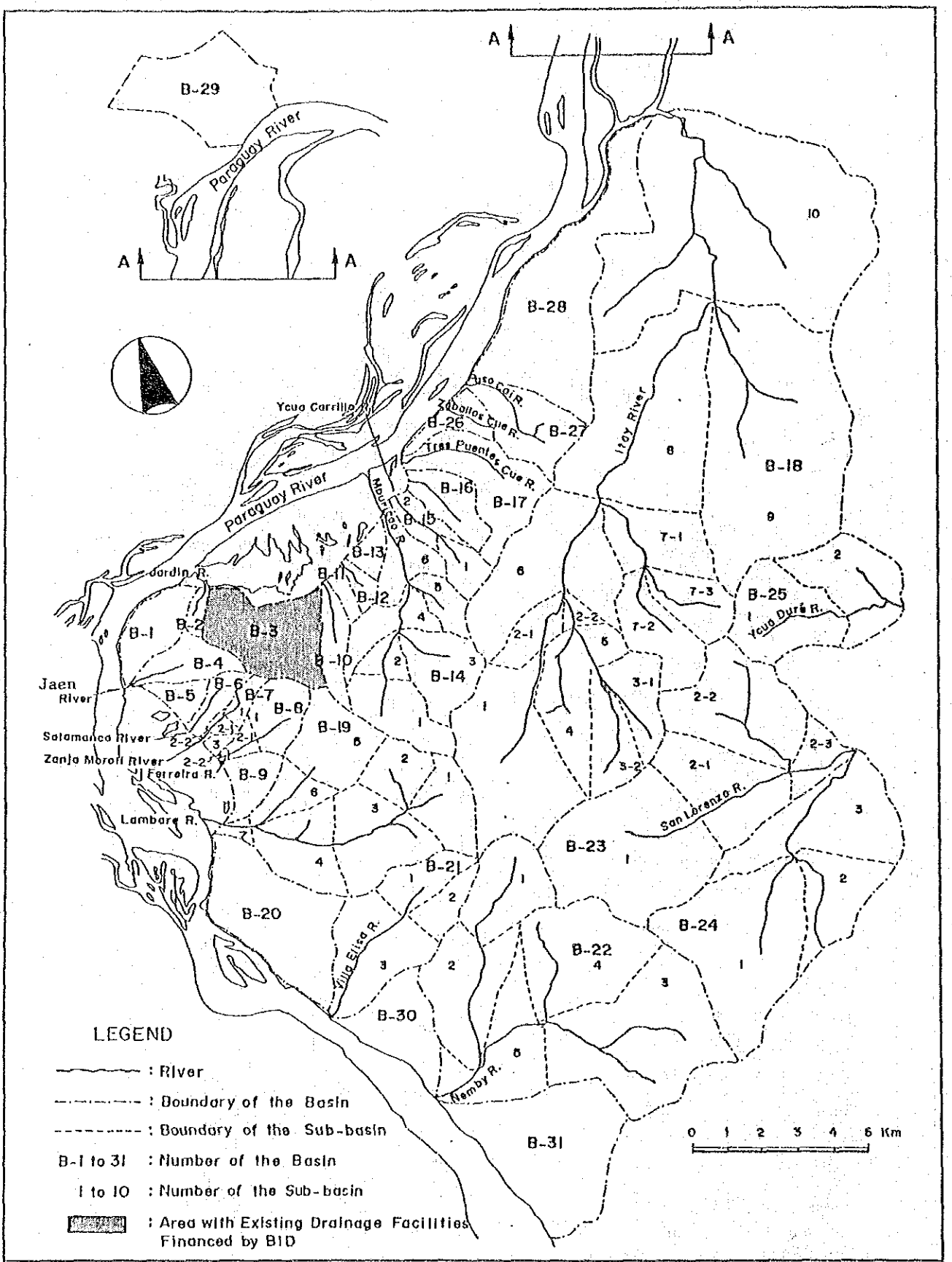


図3－1　調査対象域の流域分割

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

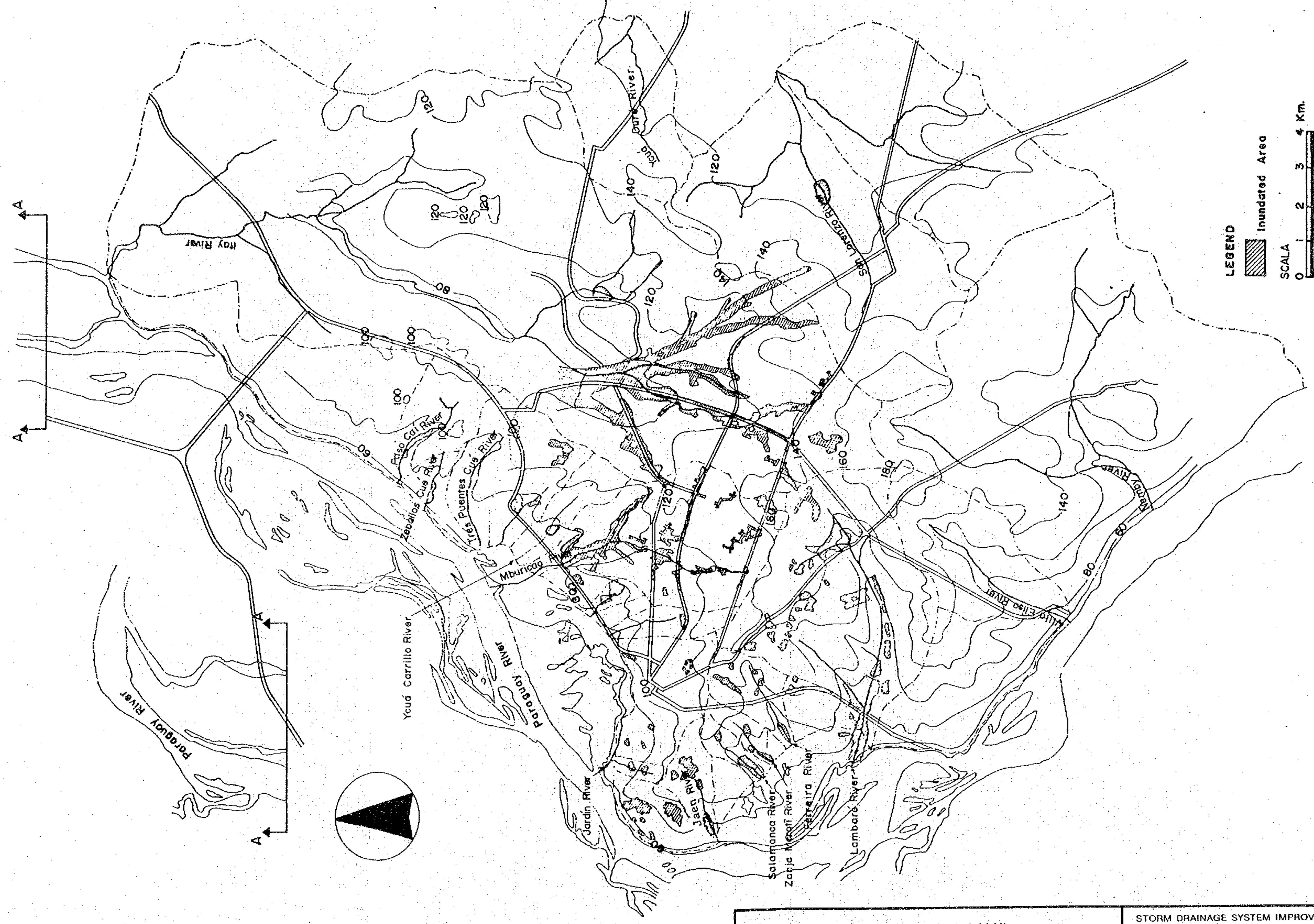


図3－2　既往最大洪水被害発生地域

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

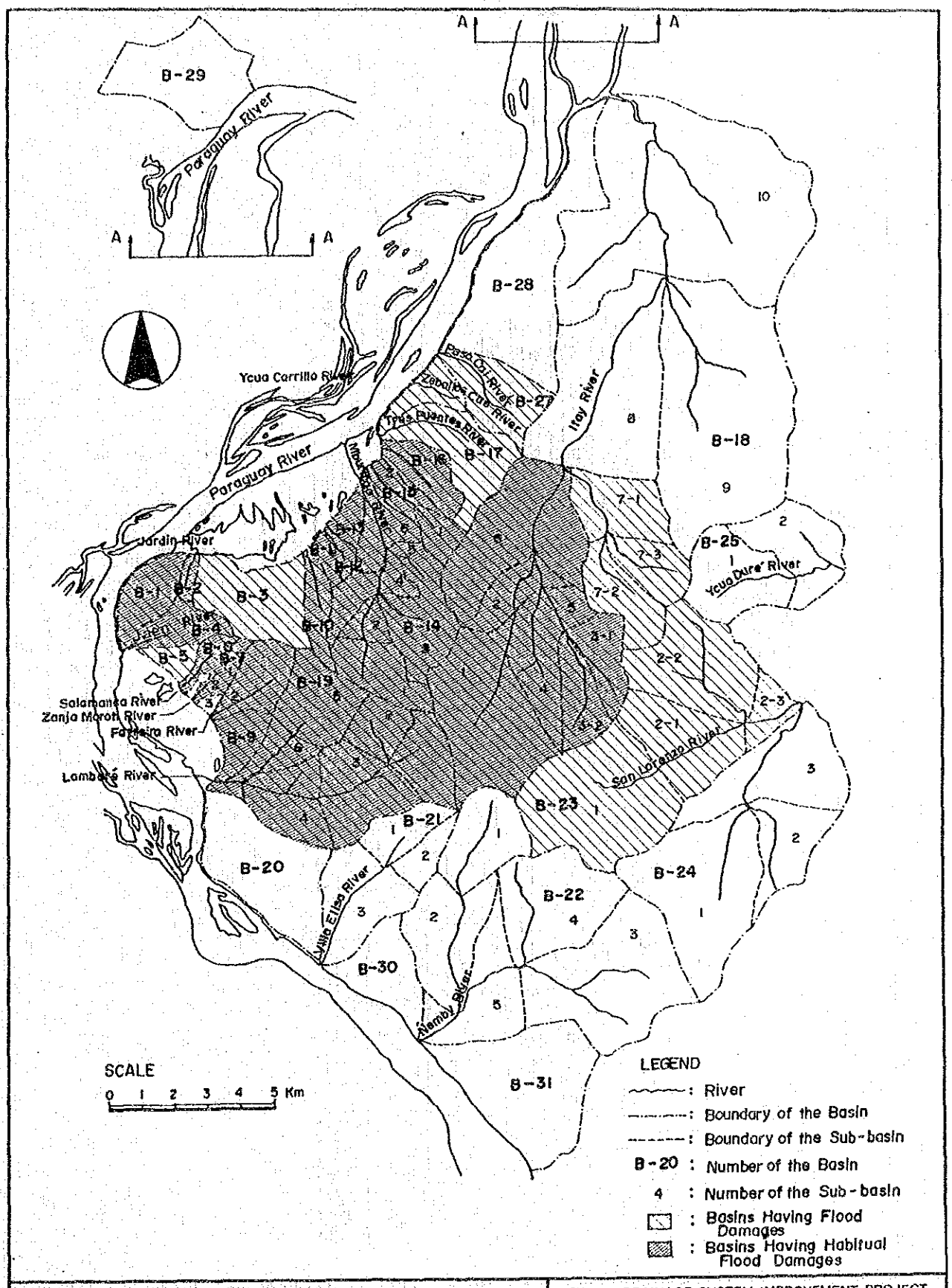


図3－3　洪水被害の流域別比較

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

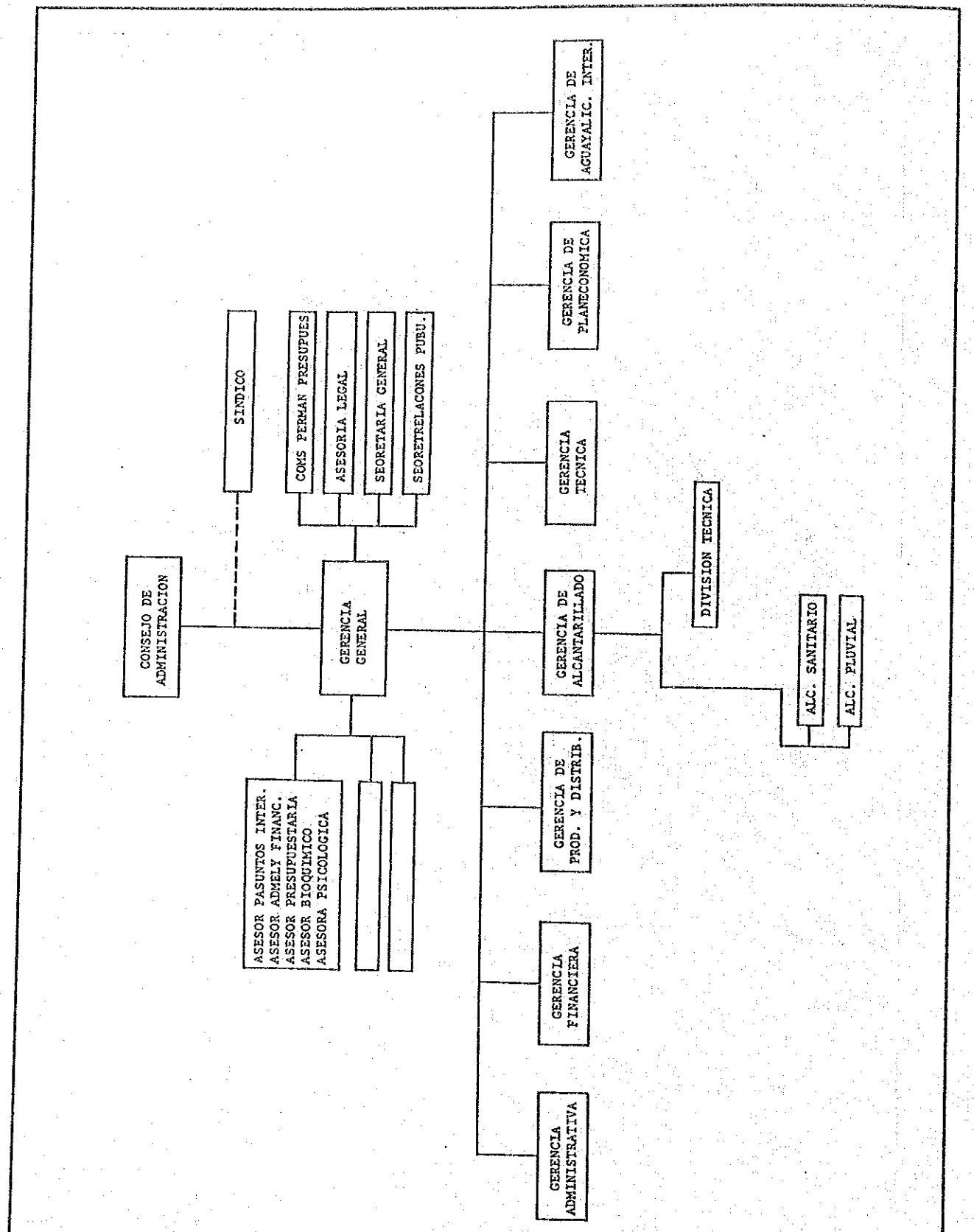


図３－４　コルポサナ組織図

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

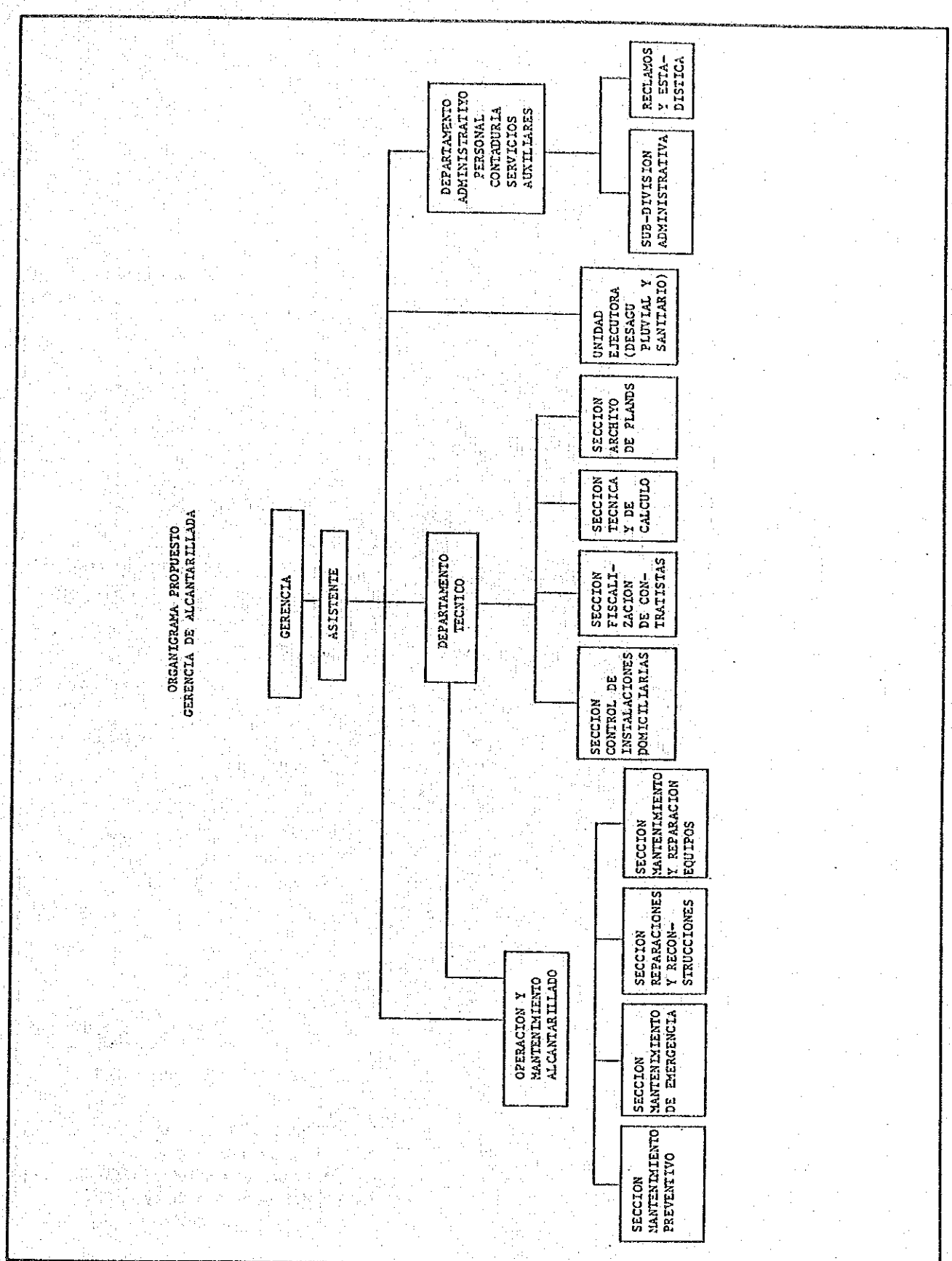


図３－５　コルポサナ下水道部の組織図

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

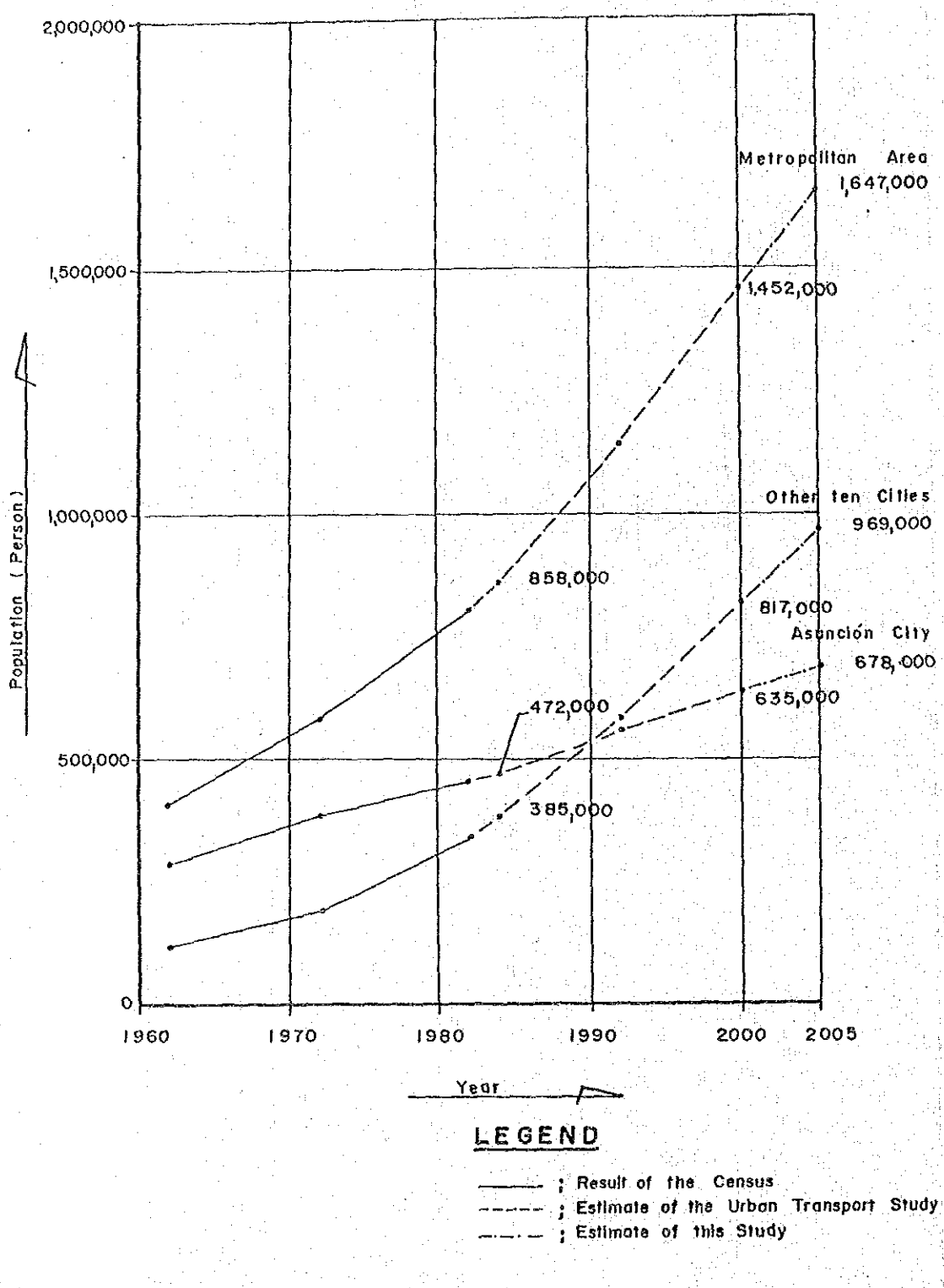


図5－1　予想人口増加

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

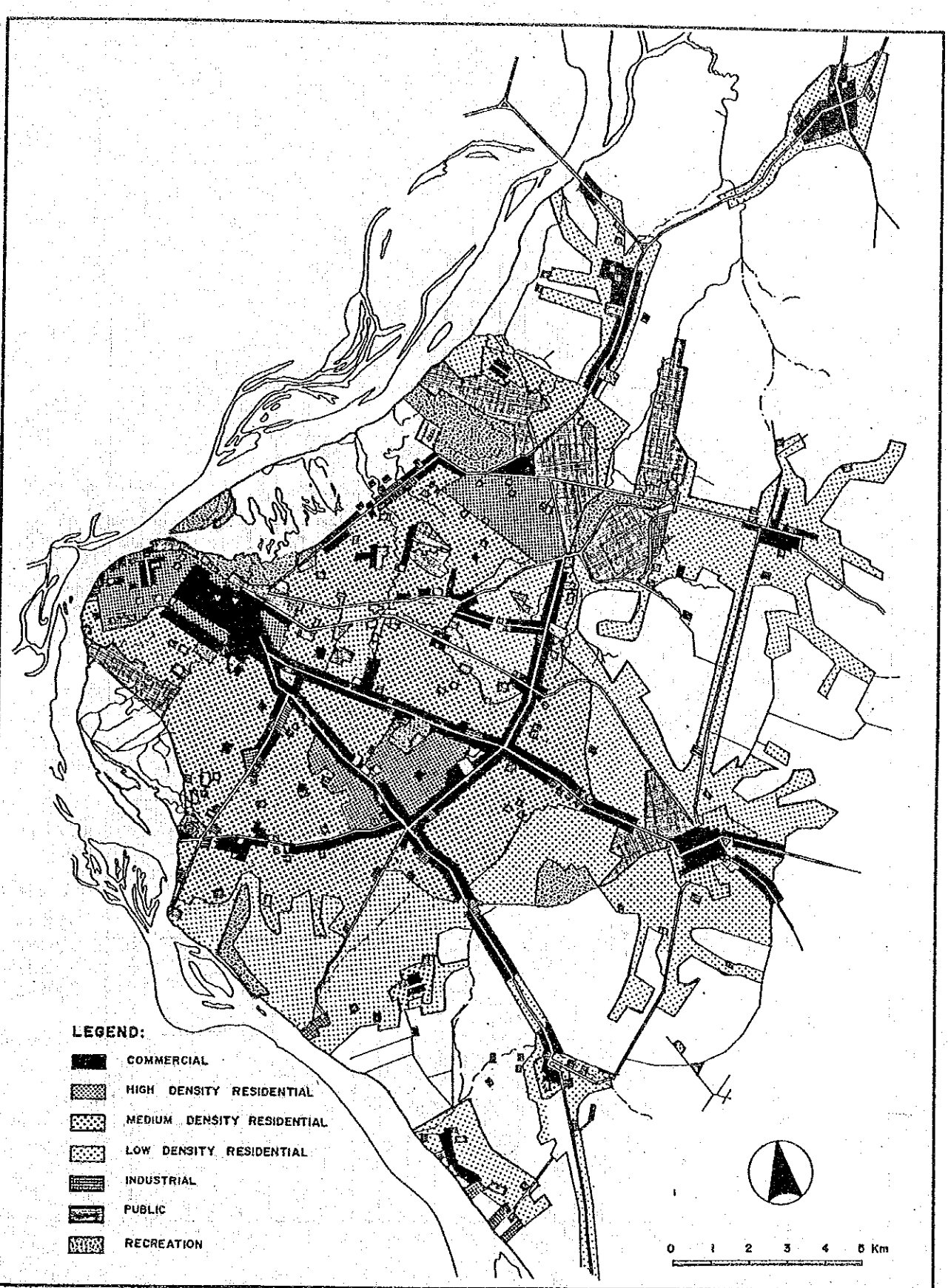


図5－2　2000年度土地利用

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY