第5章　本格調査の内容

5－1　調査の基本方針

調査の過程で治水計画、流域管理について、当国に技術移転または考え方の基本として定着させる必要があることは、次の3点である。

① 水位、雨量、流量の観測の適格化と計画への適用。

② 流域管理としては土壌保全だけでなく流出抑制のためにも重要である。

③ 水系一貫の考えに基づく治水計画の確立。

(1) 水位、雨量、流量の観測の適格化と計画への適用について

水位、雨量については既に観測が行われているようであるが、データを整理し、治水計画のために有効に活用できるようにする必要がある。すなわち、時間雨量、日雨量等について、計画に生かせる資料の整理について定着させることが必要である。流量については、観測データの整理の状況については不明であり、観測の適否も含めて指導する必要がある。

(2) 流出抑制のための流域管理の重要性について

ヴィティ・レブ島に西部における上流山地部は、かなり樹木の育成が無い状態であり、土壌流出の抑制の観点から松等の植林がされている。しかしながら、これらは土壌流出の抑制を目的とするものであり、洪水に対する流出抑制を全く目的としていないため草本による土壌流出対策と同等に考えられている。従って、草本は樹木と違い、根の部分による表層近傍の浸透層の形成が不十分であるため、流出抑制にはほとんど利かないことを、まず認識すべきである。従って、流出抑制のためには樹木の育成が極めて重要であり、これを流出抑制という観点からも、計画的に進める必要がある。

ところで、当国においては、植林として松が一般的に使われているが、生態学的または生育の面からも樹種として適当であるかについては、評価が必要である。

また、流出抑制として樹木による植林にのみ期待することは整備が長期間を要することから、短期的な視点から洪水流出、ならびに土壌流出に対する構造物による抑制を図る必要がある。このため、小規模堰堤群による洪水・土壌流出抑制について、その導入検討をする必要がある。

構造物による洪水・土壌流出抑制を図ることは、ダム計画を立てる場合の前提ともなると考える。

(3) 水系一貫の考えに基づく治水計画の確立について

前述の洪水・土壌流出抑制を前提に、河道における治水計画についても水系一貫の考えに基づいて計画を策定する必要がある。施設要素として考えられる施設としては、上流のダム、

中下流域における遊水池、放水路であり、さらに全川にわたって、河道の拡幅、築堤等である。また、これら構造物を流水から守る護岸の計画である。

1）ダ　ム

まず、適当なダムサイトがあるかどうか不明であり、詳細な調査が必要である。既に、二つの大規模ダムが存在している以上、ダムによる洪水調節について検討する余地は多分にある。

ダムについて考えなければならないことは、

① ダム上流部の洪水・土壌流出抑制対策とセットで考える必要がある。

② いま一つは、ダムサイドはそれほど恵まれていないと思われることから、他の用途、例えば発電、水道との多目的ダムを考える必要がある。

発電については、当国のエネルギー対策が当分水力発電を基本に考えていることから、これとの多目的化は現実的であると思われる。水道については、人口の増加、産業の発達にとって、地下水から表流水利用への移行が予想され、水道との多目的化についても検討が必要である。

以上から、ダムによる洪水調節を考えるとき必ずエネルギーならびに水資源の動向も考慮した計画を立てることが肝要である。

2）中下流部の放水路、遊水池

まず放水路については人家、資産が、山地から平野に出る扇状地から下流部に比較的多く、河口付近のデルタ地域にはあまり存在しないことから、扇状地の最上流部から人家、資産の存在する地域を避けて放水路を建設し、海岸に排水できれば有効である。これについては、大いに検討の必要性がある。

遊水池については、当河川がほとんど人の手が入っていないことから中下流部において河道がかなり蛇行している。従って、これをショートカットすることにより旧河道を遊水池として活用する可能性がある。また、中流部に遊水池として利用可能な草地も見受けられることから、遊水池は平常時の利用、権利の制限なども含めて可能性の検討が必要である。

3）河道計画である河道の拡幅と築堤

築堤については、現状が全くの無堤であることから、築堤をするとしても、ごく限られた必要最低限のものとすべきである。前述のように、ほとんどの橋が潜水橋であることから、築堤をする場合には、これらの橋梁の嵩上げが必要である。河道沿いの築堤については全川連続堤にすることは不可能である。人家、資産のある所だけの輪中堤についても考えられるが、人家、資産がそれほど密集していないこから、必要な調査を待たなければ判断できないものの、可能性は低いと思われる。

拡幅については、河道に人家が近接している所がそれほど顕著ではなく、河岸段丘も発達しており、これらの土地の田畑等への利用もそれほど多くないことから、これらを利用した

河道の拡幅はできるが、問題は、掘削土の処分である。河口部での浚渫土の処理として河口に捨て土するほど残土の処分に困っている現状から、河道拡幅に伴う残土を処分することは困難である。

以上から、築堤、拡幅を主体とする計画立案はかなり制約を受けることが予想される。従って、放水路、遊水池による治水計画を策定することが必要である。

4）護岸及び河道整正

護岸については、河岸の侵食により人家に被害が出ている所があることから、護岸による河岸の浸食対策については、現実に即して実施する必要がある。ただし、この場合、材料についての検討が必要である。コンクリートのブロックによるものでなく自然石、木、竹等による景観、環境を考慮したものを使う必要がある。また、現地での調達の容易な材料であることも必要である。

河道計画で必要なことは、河道の整正である、つまり、必要に応じてショートカット、また、合流点の処理が必要である。これらは、計画としては水系一貫の考え方のもとに立案されるべきものであるが、効果は、それほど広範囲ではないが、低地方の洪水氾濫を軽減する観点から重要な施策である。

以上述べてきた調査の基本方針を以下に要約する。

観測の重要性は言うまでもない。

計画としては、流域からの洪水・土壌流出の抑制対策がまず第一であり、これについては植林だけではなく、構造物による方法も積極的に取り入れるべきである。

ダム計画については、これらの洪水・土壌流出抑制を前提とし、発電、水道との多目的化を図り計画することが必要である。このため、島全体の水資源に関する調査、検討も必要である。

河道については、築堤、拡幅による洪水対策は多くの制約があり、ごく限られた部分で実施することになろう。そのため、放水路、遊水池による洪水調節を積極的に考える必要がある。

河道計画の中で護岸の整備は、材料を考えた上で計画する必要がある。また、低地部については合流点の処理等、河道の整正、付け替えなどを水系一貫の考えのもとに計画する必要がある。

5－2　調査実施上の留意点

5－2－1　調査のポイント

(1)　基礎資料の整備

地形・地質、植生等に関する地図情報については、フィジー国は、開発調査の対象国の中では相当程度良く整備されており、これらの資料を活用して調査を進めることができると考えられる。一方、降雨量、河川流量等の水文資料については、観測施設数、資料収集・

整理状況とも、調査の円滑な実施のためには十分とは言えない。このため調査実施に際しては、これらを基に水文資料の収集・整理・検定に十分な力点を置くとともに、重要地点での新規水文観測を多く行い、後のマスタープラン作成に支障をきたさないよう十分配慮しなければならない。また、水文資料の多くは、公共事業省水文局が保管しているため、本調査の着手ミッションは同省とハイレベルな協議を行い、本調査に対する水文局の全面協力について再度確認を行う必要がある。

(2) 93年キナ台風の水文評価

UNDP洪水防御調査においても93年キナ台風の水文解析評価、被害評価はなされていない。このため、キナ台風時の洪水状況、被害状況についての資料を収集、解析を行う必要がある。

(3) UNDP洪水防御計画調査の活用

レワ川については、UNDPにより一部調査が実施されている。本調査においては、5－2－9に示す同UNDP調査評価結果を踏まえ、基礎資料としてUNDP調査を最大限活用するものとする。

(4) 水系一貫した洪水防御計画の作成

流域の重要性にあわせ、対象洪水を設定し、それに対する複数の洪水放御施設（ダム、堤防、放水路、遊水池等）、流出制御施設（植樹等）を組み合わせた総合的な洪水防御計画を流域ごとに作成する。

(5) 総合水資源開発計画の作成

洪水防御計画に合わせ、多目的ダムなどの水資源開発施設計画を含む総合的な開発計画を作成する。この際、フィジーの既存の開発計画等を活用するものとする。

(6) 流域の土地利用に関する提言

フィジー国特有の土地所有形態や森林伐採の現状を踏まえた、土地利用規制及び開発方針について具体的な提言を行う。この際、同国地域会社の現状に促した、規制、開発の誘導方策についてあわせて提言を行うものとする。

(7) 現状における計画上考慮すべき主要な洪水防御施策

① 調査対象水系では飲料水供給の拡充及び電力供給源の安定確保のための新規の水資源開発が求められており、候補地の選定等も進められている。レワ川及びバ川では洪水対策計画案としてダムによる洪水調節計画案も一選択肢であり、利水との多目的開発も有望である。そのためには利水担当部局であるPWDとの十分な調整を図った上で、洪水・利水両面で最適な位置、規模等を計画する必要がある。

中下流部の洪水対策には遊水池と放水路計画案も有力な対象である。放水路が海岸までの流路を短縮することによる、塩分の侵入及び流況の変化等の影響を分水点の上流部

に及ぼさないように、最適な分水地点の位置・構造、放水路路線等を策定する必要がある。

急流河川のため水衝部において浸食崩壊が拡大しており、農地や道路用地等を守るため緊急の対策を必要としている。水衝部浸食対策としてローカル資材を活用した従来工法に代わって輸入資材を使用した護岸・護床工法に事例もみられる。施工性、耐久性及び経済性から、その効用を検討する。また、レワ川の河口から上流20km地点の急湾曲部下流左岸の水衝部では護岸工としてSand Shoreが設置されており、その効果及び問題点等について検討を行う。

現状取水施設及び橋梁等の構造を把握し、これらの施設が洪水対策上問題があれば、その対応策を検討する。また、洪水対策が取水施設等に及ぼす影響を検討し、問題があれば、取水施設等に対する改善策を策定する。

洪水対策の一環として現在レワ川とバ川の下流部で浚渫が実施されている。その浚渫深及び浚渫土砂の土捨場等の状況から判断して、その効果の持続性に疑問点がみられる。また、浚渫に伴う塩水遡上による影響も見受けられる。他の洪水対策の補助的対策として浚渫土砂の処理対策を含めてその必要性を検討し、実施担当部局に助言する。

② 今回の調査を踏まえた各流域での計画上考慮すべき洪水防御施設等は以下のとおりである。

(a) レ　ワ　川：レワ川放水路(ナウソリ市)、中流部遊水池計画、本川中下流部築堤、浚渫、護岸計画、本支川多目的ダム等

(b) シンガトカ川：中流部遊水池計画、部分築堤、浚渫、護岸計画、上流部植樹計画等

(c) ナンディ川：バツルダム再開発計画、ナンディ川最下流部合流点処理、ナンディ川下流合流点計画

(d) バ　　川：バ川下流築堤・護岸・浚渫計画、バ川上流部多目的ダム計画等

(8) その他の技術的留意点

① 河川横断測量図はレワ川において河口からその上流20km地点まで500mピッチで測定されており利用可能である。しかし河道特性を把握するためには200m程度のピッチで河川横断面が必要である。従って、主要4河川（ナンディ、シンガトカ、レワ、バ）について河口から洪水被害の影響が大きいと思われる地点まで縦横断測量を200mピッチで実施する。

また、優先プロジェクトによるF／S段階における河川施設計画地点の地形測量及び地質調査（ボーリング）・土質調査を必要に応じて実施する。

② UNDP／FAO調査において収集・整理された既往洪水の降雨、水位・流量に関する資料は、その妥当性の評価を十分に行った後に、その利用を判断することとする。特に洪水流量については、実測の記録より求めた値の算出方法の確認を行うとともに、洪水

痕跡等による検討をあわせて評価する必要がある。また、洪水流量の検討には、氾濫や遊水の影響をでき得る限り考慮して、その妥当性を評価する必要がある。

③ UNDP／FAO調査における河川流量に関する資料期間では、開発水量の計画検討のための流量資料(日単位あるいは、月単位の流量資料)の期間として不十分である。まず、最近の既存の水位記録及び水位流量曲線を基に流量記録を更新し、さらに不足する場合には、低水流出モデルにより河川流量を推算する必要がある。

④ 洪水制御にかかる計画検討を行うための水理モデル（氾濫解析モデル）は、潮位の影響を受ける区間、分合流のある河道、及び遊水池を持つ河道区間の洪水流を合わせて表現できる水理モデルとする。

5－2－2　カウンターパートの確保

今回のフィジー調査において、現地UNDP常駐代表等の各援助機関から、同国における援助プロジェクトの最大の問題としてカウンターパート確保の困難性が指摘された。このため調査団として、フィジー国政府本件調整委員会に対し、本件調査が必要とする18分野におけるカウンターパート職員を選定の上、職員の実名を付したカウンターパート名簿を提出するよう要請した。これに対し同委員会は、最終会において、18全ての分野について関係省庁職員を選抜し記載したカウンターパート名簿の提出があった。これは、同国政府の対応として異例の早さであり、高く評価できるが、今後とも同名簿に基づくカウンターパート職員の配置、職員交替の場合の補充要員の確保等につき、フィジー側と密接な協議、連携を継続すべきである。

5－2－3　地域住民の意向の反映

独特な土地所有制限にかんがみ、計画策定に当たってはプロジェクトの対象地域住民の意向に十分考慮を払う必要がある。ただし、住民及び関係機関との間の調整は先方実施機関の主体性のもとに行う必要がある。

5－2－4　優先プロジェクト

フィージビリティ調査の対象となる優先プロジェクトの選定に当たっては、流域選定のためのクライテリアを提起し、先方との十分な協議を行う必要がある。また、適切な事業規模及び具体的な資金源を想定した現実的な計画づくりを行う必要がある。

5－2－5　国際援助機関等との調整・連携

今回調査団がUNDP常駐代表、SOPAC事務局、DHA現地事務所関係者と協議した結果、

各機関とも本調査に多大な関心を有しており、日本側の情報提供を望むとともに、それぞれの所有する資料の提供について、積極的に対応する旨を表明してきている。

本調査の円滑な実施、及び調査結果の活用、フォローアップの観点から、これら国際援助機関等との調整・連携は極めて重要であり、本調査の期間を通じて、UNDP、FAO、SOPAC等の国際機関、地域機関との密接な連携、協調に努める必要がある。

5－2－6　長期専門家の派遣

本件調査の実施により、同国に常駐する洪水防御分野の日本人専門家の必要性がフィジー側及び地域機関より指摘されたが、調査の円滑な実施確保はもとより、フィジー国洪水防御体制、人材の整備、本件調査完了後適切なフォローアップの観点からも、長期専門家の派遣は極めて有意義であり、先方政府から正式要請があった場合には、前向きに対処することが望ましい。

5－2－7　ローカルコンサルタントの活用

現地再委託・補助事業(測量、地質、土質調査等)のためのローカルコンサルタントとして、純粋のフィジー国のコンサルタントは、まだ育っていないが、オーストラリア及びニュージーランドのコンサルタント数社は事務所を持ちフィジー人を使用して活動している。今回接触した2社はシンガトカ橋、バ橋の調査・設計等フィジー国の開発プロジェクトに深くかかわっており、また、我が国無償資金協力案件である水産研究所及び気象予報施設整備等のプロジェクトにかかわる調査にも関与しており、本格調査時の再委託は対応可能である。現地企業の活用は、同国経済政策の主要課題であり、同国コンサルタントの現状を踏まえ、最大限に活用する必要がある。

5－2－8　車輌の供与

フィジー本島山間部の道路状況は極めて悪く、調査には四輪駆動車を確保することが極めて重要であるが、フィジー政府の保有する同型車輌の台数は限られており、このためフィジー政府は、車輌6台の供与を強く要望してきている。今回協議において、フィジー側が20名を超えるカウンターパート職員を迅速に選定してきたこともあり、これらカウンターパート及び日本側調査団の運送、機材の運搬のため相当数の車輌を投入せざるをえない状況にある。また、2年間という限られた期間内に四つの流域の本調査を完了するためには、各流域で同時並行的に作業を進めざるをえず、このためには車輌の増強はやむをえない。現在フィジー側が要望している車輌台数（6台）は、調査団がフィジー側と再三の協議の結果、落ち着いた数字であるので、予算等の制約があることを考慮しても、これを最大限尊重する必要

がある。

5－2－9　UNDP　レワ川洪水防御M／PのJICA調査への適応性について

(1)　UNDP調査の現時点での評価

UNDPによるレワ川洪水防御M／P調査（以下、UNDP調査と呼ぶ）は、1988年より5カ年にわたり、水文基礎資料の収集から始め、流出モデルの作成から工法の検討に至るまで、段階的に着実な検討を行っており、また、その検討結果の妥当性も比較的高い。特に、この調査において以下の点については高い評価が与えられる。

①　基礎的な水文資料の収集と、観測体制の整備に重点を置き、資料の信頼性の検定にも配慮していること。

②　地形が類似し、技術的にも信頼度の高い日本の調査、計画手法を採用しており、基本的な計画手法が妥当であること。

従って、使用したデータの精度、期間、モデル適用の前提条件など、なお精査すべき点はあるが、今回JICA開発調査の基礎資料として使用するに十分なレベルを有する調査であると、現時点では判断される。

しかしながら、以下の理由によりUNDP調査はレワ川のマスタープランと言えるレベルのものではない。

①　計画の基礎となるべき基本高水、計画高水流量（計画対象洪水）及びその流量配分が定められていない。

②　既往最大洪水である93年キナ台風による洪水が検討対象となっていない。

③　検討区域がレワ川デルタ地域のみであり、流域全体にわたる検討が行われていない。

④　検討対象施設が放水路、築堤及び浚渫のみであり、河道法線、護岸施設の検討がない。また、築堤の高さは検討されているが、幅、形状の検討がない。

⑤　低水計画のための基礎検討がなされておらず、このため、多目的ダム等の治水施設の検討が欠落している。また、レワ川の洪水防御に重要な役割を果たしている中流部遊水池の評価及び、その開発可能性についての検討がなされていない。

⑥　浚渫に伴う塩水遡上の影響を明らかにしていない。

⑦　施設の費用便益比の検討を行ったのみであり、最終的な施設計画としてまとめられていない。

平たく言えば、UNDP調査は、レワ川下流域デルタ地帯の局部改良計画に過ぎず、流域を一貫した、いわゆるマスタープランではない。また、その検討レベルは、日本で言う基本計画作成のための基礎検討が了した段階程度であると言える。

(2) UNDP 調査を踏まえた JICA 調査の進め方

上記を踏まえ、レワ島における本件開発調査の進め方としては、以下のとおりとするのが妥当と考えられる。なお、他の3河川についても完成させる計画のレベル、内容はレワ川の計画と同一とする。

1) UNDP 調査の活用方針

① UNDP 調査によって収集、整理された水文基礎データは、精度、期間についてのチェックを行った上で、最大限使用する。

② UNDP 調査で使用された流出モデルは、適用条件をチェックし、必要に応じ修正をした後、JICA 調査にも使用する。

③ UNDP 調査が結論として得た築堤、浚渫計画代替案検討結果は、基礎検討の一部として使用する。

2) 今後 JICA 調査で追加すべき調査内容

① デルタ部の水文資料については UNDP 調査を踏まえ、追加収集を行い、必要な地点については水文観測機器を設置し、追加観測を行う。

② 上・中流部の地形、地質、水文資料を追加収集整理する。特に、遊水池の横断測量、既存計画ダムサイトの追加資料収集が必要である。

③ 低水流出量の検討を行う。このため、低水流出モデルの作成を行う。

④ 93年キナ台風洪水の水文資料、被害資料の収集、整理を行う。これに基づき、確率洪水流量の見直しを行う。

⑤ 浚渫に伴う塩水遡上の影響その他水質、動植物等の環境影響評価を行う。

⑥ 上記を踏まえ、計画流量配分図の作成を行う。

⑦ 計画流量配分図を踏まえ、築堤、浚渫、河道法線変更、護岸、遊水池、放水路、多目的ダムを組み合わせた総合的な治水施設計画を作成する。

⑧ 将来水需給の概略計画を検討整理した上で、流域の総合利水計画を検討する。

⑨ 流域の土地利用の変化を踏まえた、流域管理計画をあわせ作成する。

(3) UNDP 調査に関し確認すべき事項

UNDP 調査の内容及び JICA 調査への適用性を明らかにするため、以下の点について確認する必要がある。

- 既存の洪水関係調査の内容確認 (FIJ／80／017, FIJ／84／004)
- 過去のフィジーにおける洪水防御関連プロジェクト (UNDP、ADB、世銀等) の整理 (工事箇所を含む)。計画されている洪水防御関連プロジェクトの内容整理
- 流域航空写真の撮影年月日整理 (サンプル写真入手のこと)
- 河道変遷図の有無確認

- Reno Matress（UNDP報告書P 6）の内容整理
- 現存の水文関係コンピュータソフトの内容整理（アウトプット、変換モデル、インプット）。特に、流出モデルにおける降雨から流量への変換モデル、不定流の考え方整理。氾濫流モデルの考え方整理
- 流出計算に使用した水文データのチェック。特に降雨確率評価に使用したデータの観測位置、期間、93年洪水の考慮の可否確認
- 河川水位計算モデルにおける潮位の影響の考慮方法確認。過去の台風襲来時の潮位資料の整理状況確認
- 横断測量の図面及び測量位置（分布図、一覧表）入手。台風Wallyの雨量、人口、当時の資産状況入手
- 90年以降の水文資料の整理状況確認
- 資産データの整理方法チェック（調査年度、評価方法等）
- 無害流量の検討の有無確認
- 洪水防御計画、事業に関する農業省、地域開発省、公共事業省、民間（製糖会社等）のデマケ確認

5－3　調査項目及び範囲

5－3－1　調査対象地域

調査対象地域はヴィティ・レヴ島全体とするが、マスタープランの計画対象地域は同島の主要4河川（ナンディ、シンガトカ、バ及びレワ川）流域とする。

また、フィージビリティ調査（F／S）の対象地域は、優先プロジェクトの選定結果に基づき決定する。

5－3－2　目標年次

ナンディ、シンガトカ、バ及びレワ川流域に関する河川流域管理及び洪水制御に関するマスタープラン（M／P）の策定は、2015年を目標年次とする。

5－3－3　調査範囲

調査の範囲は、フィジー国における現地調査、及びフィジー国と日本におけるデータの収集と分析により構成される2015年を目標年次とする河川流域管理及び洪水制御計画（M／P）の策定（フェーズⅠ）、及び、これにより選定された優先プロジェクトに対するF／Sの実施（フェーズⅡ）とする。

5－3－4　調査項目

フェーズⅠ：マスタープランの策定

(1) 既存資料・情報の収集・整理

(2) 現地踏査

1）地　　形

2）流域・河川現況

3）河川施設現況

4）洪水被害

5）洪水予警報システムの実態調査

6）水利用実態

7）土地利用現況

8）衛生・環境等

(3) 実　　査

1）測　　量

2）気象・水文

3）地質・土質調査

4）水質調査

5）土砂調査

(4) 解析・検討

1）水文解析

2）流出・洪水解析

3）洪水被害解析

4）流況・開発水量解析

5）水収支計算

6）水需要予測

7）土砂流出解析

8）社会・経済状況将来予測

9）土地利用の将来予測

10）流域開発方針の検討

(5) マスタープランの策定

1）河川流域基礎資料の整備

2）洪水対策計画

3）流域・水資源管理

4）洪水対策と調和した地域開発方針

5）施設計画

6）非構造物対策

7）事業費概算

(6) 初期環境調査（評価）(IEE)

(7) 評　　価

1）社会環境影響

2）経済・財務

(8) 優先プロジェクトの選定

フェーズII：優先プロジェクトのフィージビリティ調査

(1) 追加資料の収集及び補足現地調査

(2) 施設概略設計

(3) 施工計画

(4) 管理運営計画

(5) 事業費概算

(6) 環境影響評価（EIA)

(7) 事業評価

1）社会影響

2）経済・財務

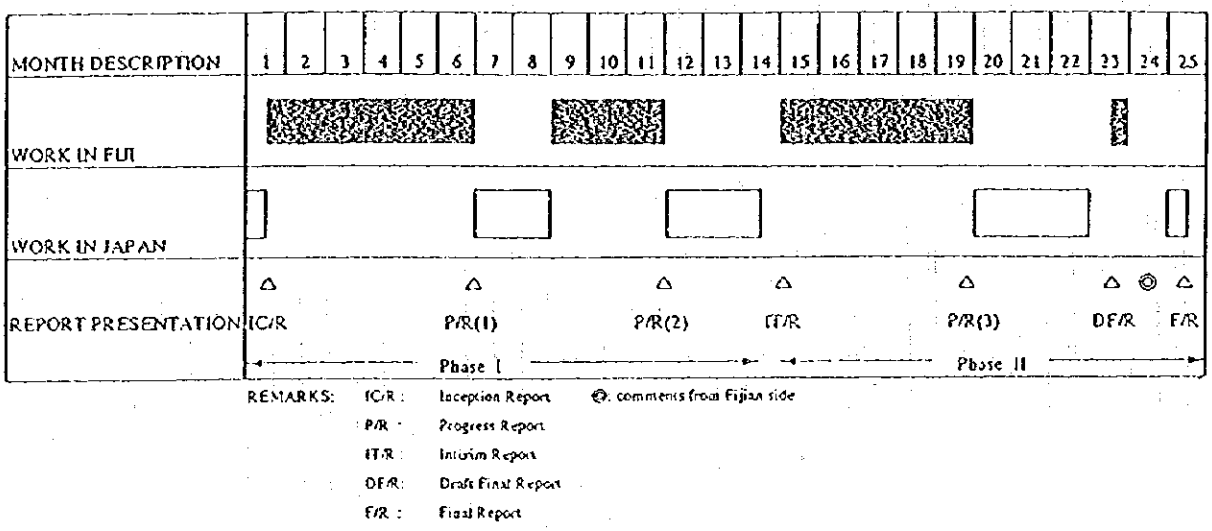
(8) 実施計画

5－4　調査期間及び工程

調査は、フィジー国内での現地調査と日本国内で行われる解析作業とで構成される。現地調査は、合計約14カ月を予定し、その間の国内作業を含め、ファイナル・レポートの提出まで合計約25カ月間の工程を予定している。

調査は大きく二つのフェーズに分けられ、第1フェーズでヴィティ・レヴ島の主要4河川流域の河川流域管理及び洪水制御に関するマスタープランを作成し、第2フェーズでマスタープランの中で選定された優先プロジェクトに対するフィージビリティ調査を実施し、報告書をとりまとめることとする。調査工程(案)は、表5－1のとおりである。

表５－１　調査工程(案)



５－５　報　告　書

本開発調査の報告書の提出部数は、以下のとおりとする。

(1) インセプション・レポート

記載事項：調査の基本方針、方法、作業工程、要員計画等

部　　数：英文35部（うち、先方政府へ20部）

(2) プログレス・レポートⅠ

記載事項：第１次現地調査作業までの結果

部　　数：英文35部（うち、先方政府へ20部）

(3) プログレス・レポートⅡ

記載事項：第２次現地調査作業までの結果

部　　数：英文35部（うち、先方政府へ20部）

(4) インテリム・レポート

記載事項：第２次国内解析作業までの結果

部　　数：英文35部（うち、先方政府へ30部）

(5) ログレス・レポートⅢ

記載事項：第３次現地調査作業までの結果

部　　数：英文35部（うち、先方政府へ20部）

(6) ドラフト・ファイナル・レポート

記載事項：全調査結果

部　　数：英文35部（うち、先方政府へ20部）

(7) ファイナル・レポート

記載事項：ドラフト・ファイナル・レポートに対するフィジー国側のコメントを受け、

必要な加筆修正を行ったもの。

部　　数：英文70部（うち、先方政府へ50部）

5－6　調査の実施体制

本開発調査におけるフィジー国側の実施機関は、農業・水産業・森林省（Ministry of Agriculture, Fisheries, Forests and ALTA (MAFFA)）である。

フィジー国側は、本調査を効果的・効率的に実施するため、地域開発省（Ministry of Regional Development and Multi-Ethnic Affairs (MRDMEA)）が統括するステアリング・コミティーを設置する。ステアリング・コミティーを構成する機関は、以下の省庁が予定されている。

(1) 農業・水産業・森林省（MAFFA）
  1）灌漑排水局 Dept. of Drainage and Irrigation （D & I）
  2）森林局 Dept. of Forest （DOF）
  3）普及局 Dept. of Extension （DOE）
(2) 地方開発省 Ministry of Regional Derelopment and Multi-Ethnic Affairs （MRDMEA）
(3) フィジー人問題省 Ministry of Fijian Affairs
  1） Native Land Commission
  2） Native Land Trust Board
  3） Fijian Administration
(4) 公共事業・経済基盤・運輸省 Ministry of Public Works. Infrastructure and Transport
  1）公共事業局 Public Work Dept. (PWD)
(5) 土地・鉱物資源・環境・エネルギー省 Ministry of Land, Mineral Resources, Environment and Energy
  1）土地・測量局 Dept. of Land and Surveys
  2）鉱物資源局 Dept. of Mineral Resources
  3）環境局 Dept. of Environment
  4）エネルギー局 Dept. of Energy
(6) 財政・経済開発省 Ministry of Finance and Economic Development （MFED）
  1）中央計画局 Central Planning Office （CPO）

5－7　要員計画(案)

本開発調査には、おおむね以下のような専門分野をカバーする要員が必要である。

- 総括／流域管理
- 流域管理

- 河川計画
- 水資源開発
- 気象・水文
- 水理解析
- 地質・土質
- 土壌浸食・流送土砂
- 水　　質
- 低水管理
- 森林管理
- 地域開発／土地利用計画
- 測　　量
- 環　　境
- 河川施設計画
- 施工計画／積算
- 社会経済／事業評価
- 組織／制度
- 電源開発

5－8　調査用資機材(案)

現地調査に必要な資機材として以下の機器が考えられる。

(1) 四輪駆動車
(2) 測量用機材
(3) 気象・水文観測機器
(4) 携帯式水質測定器
(5) データ処理・分析用パソコン
(6) コピー機

5－9　相手国の便宜供与事項

平成８年２月14日に締結されたＳ／Ｗ及びＭ／Ｍに記載の事項を参照のこと。

添　付　資　料

1．フィジー国政府からの要請書（T／R）

2．Scope of Work

3．Minutes of Meeting

4．Questionaire 及び調査結果

5．主要収集資料リスト

6．主要面会者リスト

7．現地調査経費資料

1．フィジー国政府からの要請書（T／R）

Terms of Reference

on

Study for Watershed Masterplanning and Flood Control

of

Four Major Viti Levu Rivers

in

Fiji

Terms of Reference on Study for Watershed Master Planning and Flood Control of four major Viti Levu rivers in Fiji

A. Background

A.1 Necessity of the Study

Fiji is composed of more than 300 islands which disperse on the South Pacific Ocean. The total area of Fiji is about 18,300km^2. Among the many islands, the Viti Levu island is the largest one (10,380 km^2), where the capital city Suva and other major cities in Fiji are located.

Viti Levu island is characterized by steep mountainous topography. About 70% of the total area is covered by mountainous area and the flat land is distributed only along narrow valleys of major rivers, on river deltas and coastal area. The peak of the island is Mt. Victoria (1,320 m). The major five rivers, Rewa, Navua, Sigatoka, Nadi and Ba are engraving the mountainous area and flowing down to sea. The gradient of river bed is very steep.

The climate of Viti Levu is "oceanic tropical" with south easterly trade wind. Average annual rainfall varies from 3,000mm to 5,000mm in east side and 2,000 mm to 3,000 mm in the west side of the island. It is a remarkable characteristic that the tropical cyclones with strong wind, heavy rain and sometimes high tide attack Fiji almost every year from December to April and cause large disasters.

The population of Fiji is about 700,000 and that of Viti Levu about 540,000 which is 75% of the total. The population of Viti Levu has concentrated on the major cities and their peri-urban areas which are located in the downstream areas of five major rivers.

The major industries of Fiji are agriculture, fisheries and tourism. The major productions are in sugarcane, coconut, cocoa, ginger etc. for export and rice, maize and root crops for domestic use. Recent economic policies have prioritised export oriented manufacturing sector.

Nowadays, Fiji is searching for a sustainable socio-economic production level to these domestic crops whilst encouraging small-scale commercialisation. At the same time, recent years have seen tradicional root crops as dalo and cassava come into their own as high value crops both on domestic and export markets.

Land and flood improvement works in Rewa and Navua Rivers have realised great abundance in tradicional cash crops of nuts, fruits, mangrove, river and coastal fisheries resources. These involve a lot of women labour.

According to the statistics data, the average number of cyclones which attack Fiji is 1.2 times per year. Such cyclones have given great damages to Fiji. The most tragic disaster of all recorded cyclones in the past century occurred in 1931 when 206 lives were lost mostly from drowning. In the recent decade such cyclones as "Bebe" in 1972, "Wally" in 1980, "Oscar" in 1983, "Cyril" in 1984, "Erick & Nigel" in 1985, "the cyclone of 1986" and Kina of 1993 attacked Fiji and caused heavy damages to human life, buildings and houses, goods and households, crops such as sugarcane, rice, ecc. and public facilities such as roads, bridges, water and power supply systems, telecommunication systems and public buildings.

The extreme "Kina" of 1993 caused massive flood damages in Ba, Nadi Sigatoka, Navua and Rewa.

Many highway bridges of Sigatoka and Ba were broken down, consequently stalling economic production until repaired.

Fiji's major Rewa River is already the subject of watershed study and river improvement masterplan. The immediate need now is to have complete coverage of major rivers in Viti Levu.

The Rewa River bridge was also threatened were it not for the on-going river dredging which prevented overtopping of this bridge by 1.8m.

The population of city and its peri-urban areas has increased year by year due to rapid inflow of population from rural area. The produce of sugarcane and crop diversification are also planned to be increased in such areas. Under such circumstances as the population and properties of catchment areas will be rapidly increased, the flood damage potential in the areas will be also remarkably increased year by year.

Commercialisation of agricultural commodities is rapidly increasing in such areas whilst it is planned to intensify diversification with sugarcane production on the flats and discourage damaging steep hill cultivation.
This is supported by current efforts to research crop production within the cane belt.

Therefore, to alleviate and lessen such disasters from drought and flood the fundamental watershed development planning measures are required to be administrated and managed as soon as possible according to their priorities.

To realise the control measures above, the implementation of watershed masterplanning and flood control study has an absolute necessity.

A.2 Institutional Frame Work

1. Domestic Provision

The Drainage and Irrigation Department, Ministry of Agriculture, Fisheries and Forests will be the executing agency for the study. The counterparts and logistic support to the extent necessary for the satisfactory completion of the study will be provided by the Drainage and Irrigation Department. The liaison with other local governments and ministries will be arranged through the counterparts and the department.

2. External Assistance Needed

In view of possible difficulties in dealing with complex problems involved, the external technical assistance in proceeding with the study will be required. The Government of Japan, which has deep experience in solving similar problems, will be invited to offer its assistance in this connection.

B. Objectives of the Study

The objective of the study will be :

1. To formulate watershed and flood control master plan in the catchment areas of major rivers in Viti Levu.

2. To carry out the feasibility study on the project with high priority, which is identified among the projects in the master plan.

3. To design specific flood diversion option in Rewa River identified under recently completed Rewa river improvement master plan study.

C. Plan of Operation

C.1 Study Area

The study area will cover the catchment areas of the major rivers in the Viti Levu; those rivers are Nadi, Sigatoka, Ba and Rewa river. The total study area will be approximately 10,400 km

C.2 Scope of Works

C.2.1 Observation of Runoff

In order to reinforce the insufficient existing data and to verify the results of rainfall and runoff analysis, water level observation stations are necessary to be installed in these major rivers. The observation of runoff is to be carried out from the commencement of the study.

C.2.2 Basic Study of the Study Area

In order to clarify the basic characceristics of the study area, the following basic studies are to be carried out.

1. Collection of data and information relevant to :
   - Topography and dam hydrogeology
   - Meteorology and Hydrology
   - Geology and soil materials
   - Land use and legislations
   - Water resources development
   - Flood control and erosion control work
   - Socio economy
   - Environmental Assessment
   - Demography
   - Forestry and coastal Fishery resources
   - Mapping

2. Review of;
   - Collected data and informations
   - Preceding studies and plans
   - Existing facilities relevant to flood control works, erosion control work, irrigation etc.

3. Geomorphological study

4. Geological and soil investigations

- General geological survey of the study area
- General foundation, investigation of embankment, diversion channel, dam, weir, etc.
- Sampling and laboratory test of soil materials.
- Sampling and sieve analysis of riverbed materials and suspension load

5. Soil erosion investigation

6. Land use investigation

7. Socio economic investigation

8. Environmental asssessment

C.2.3 Master Plan

Based on the basic studies, the master plan for watershed and flood control for each catchment area is to be established by implementing the studies and analysis as shown below:

1. Hydrological study

- Rainfall analysis
- Runoff analysis for flood discharge and daily discharge by simulation model.
- Determination of design discharge in each section of rivers.

2. Flood control study

- Inundation analysis and hazard mapping
- Flood control planning
- Optimization analysis of combination of flood control measures including storage dams.

3. Layout and design of

- engineering flood control measures
- Flood forecasting and warning system studies
- Land use management
- Economic initiatives for landowners and beneficiaries

4. Socio economic study and economic evaluation

5. Environmental assessment

C2.4 Feasibility Study

The most urgent and effective project is to be identified among the projects in the master plan, then the feasibility of the project is to be confirmed by the studies and surveys as shown below:

1. Topographic survey

- Basic survey such as traverse and levelling
- Topographic maps in the required scale
- Longitudinal section survey
- Cross section survey

2. Geological and soil investigations

   - Seismic survey
   - Machine boring and permeability test
   - Test pit excavation
   - Sampling and laboratory test for soil material

3. Detailed hydrological and structural analysis
4. Preliminary design of structures
5. Construction planning
6. Quantity survey and cost estimate
7. Economic evaluation and financial analysis
8. Environmental assessment
9. Rural sociological survey and income generating initiatives inherent in development proposals.

C.2.5 Transfer of Technology

1. Overseas training and study for the counterparts
2. On-the-job training and lectures for local engineers
3. Corporatisation of training courses with USP and other regional agencies based in Fiji.

C.2.6 Reports

The following reports will be prepared in the course of the study.

1. Inception report
2. Progress report
3. Interim report

4. Draft final report

5. Final report

C.2.7 Implementation Schedule

The implementation schedule of the study is as shown in Table 1.

D. External and Government Undertakings

D.1 External Undertakings

D.1.1 Expert Service

The total of 75 man-months of experts as shown in the assignment schedule, Table 2, is required.

1. Team leader, with at least 23 years experience in planning and designing of flood control and watershed planning projects

2. River Engineer (Vice Team Leader), with at least 18 years experience in watershed management and flood control projects, analyses of rainfall and runoff, and forecasting and warning system of flood.

3. Hydrologist, with experience in observation of rainfall and runoff, and analyses of rainfall, runoff and sedimentation.

4. Dam Engineer, with experience in planning and designing of dam and related water resources development project.

5. Design Engineer, with experience in planning and designing of flood control measures such as excavation, embankment, diversion channel, retarding basin, water gate, dredging etc.

6. Construction Engineer, with experience in construction planning, quantity survey and cost estimates for flood control works.

7. Geologist, with experience in investigation of general geology of wide area as well as in foundation investigation of dam, weir, embankment and other structures.

8. Soil Engineer, with experience in investigation and laboratory test of soil materials.

9. Soil Conservation & Land Use Expert, with experience in investigation of soil erosion, vegetation and land use.

10. Topographical Engineer, with experience in surveying of flood control works and supervision of survey work.

11. Economist, with experience in investigation of socio economy and economical and financial studies of project.

12. Environmental expert, with experience in investigation and assessment for environmental impact due to implementation of the project.

13. Computer specialist - with experience in database and hydrogeological analysis

D.1.2 Equipment

The equipment as required for the study is as shown below:

	Q'ty
- Long chassis 4 wheel drive vehicle	3
- Automatic Rainfall recorder	2
- Automatic water level recorder (float type)	2
- Current meter (price type)	4
- Float type measurement device	20
- Water level gauge	2
- Lightwave Distancer	2
- Theodolite	2
- Auto-level	2
- Sediment Sampler	3
- Personal computer	3
- Printer	3
- Copy machine	1
- Planimeter	2

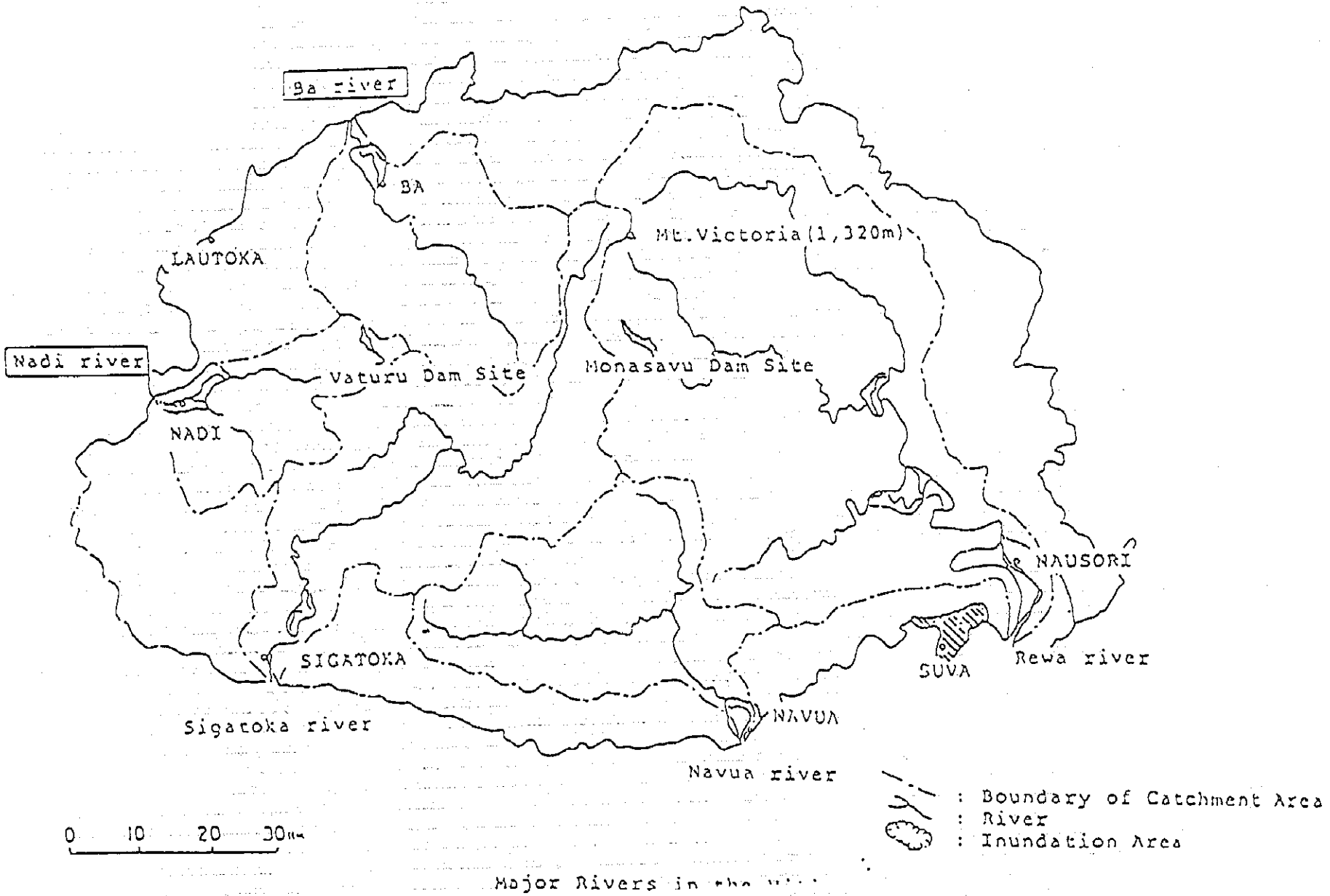
D.1.3 Cost of External Undertakings

1.	Expert service of 75 man-months	US$1,700,000
2.	Equipment	325,000
3.	Fellowship for 15 man-months	75,000
		US$2,100,000

D.2 Government Undertakings

For the implementation of the study, the Government of Fiji will undertake the followings:

1. To provide counterparts for the experts.
2. To provide the furnished office in the study area and to bear its running costs including water, electricity and local telephone charges.
3. To provide vehicles for the counterparts.
4. To provide available data, maps and aerophotographs as required.
5. To exempt import duties which may be imposed on the personal effects of the experts and equipment to be brought in for the implementation of the study.
6. To carry out topographical survey as required.
7. To carry out the geological and material investigations such as seismic exploration, machine boring, test pitting, sampling and laboratory test etc.
8. To carry out the installation of new water level observation stations, and to make observation and collect data.



Major Rivers in the ...

Table - 1 Implementation Schedule

Description	1st Year				2nd Year			
	3	6	9	12	3	6	9	12
(1) Observation of Runoff	———	———	———	———	———	———		
(2) Basic Study	———	———						
(3) Master Plan for Flood Control and Watershed		———	———	———				
(4) Feasibility Study of the Priority Project			———	———	———	———		
(5) Transfer of Technology	———	———	———	———	———	———		
(6) Preparation of Report	▼ IC		▼ PR(I)	▼ IR		▼ PR(II)	▼ DF	▼ FR

Note: IC; Inception Report, PR; Progress Report,
IR; Interim Report, DF; Draft Final Report,
FR; Final Report

Table - 2 Assignment Schedule of Experts

Description	1st Year				2nd Year				Total M/M		
	3	6	9	12	3	6	9	12	Fiji	Japan	Total
1) Team Leader	■		■		□				3.0	1.5	4.5
2) River Engineer (Vice Leader)	■		□	■	□				5.0	7.0	12.0
3) Hydrologist	■			■	□				5.0	6.0	11.0
4) Dam Engineer	■			■					2.5	2.0	4.5
5) Design Engineer	■		□	■	□				2.5	6.5	9.0
6) Construction Engineer	■				□				1.5	3.5	5.0
7) Geologist	■		■	□					3.5	3.0	6.5
8) Soil Engineer	■		■	□					3.5	3.0	6.5
9) Soil Conservation & Land Use Expert	■								2.0	1.0	3.0
10) Topographical Engineer			■						2.0	1.0	3.0
11) Economist	■		□		□				2.0	4.5	6.5
12) Environmental Expert	■		□		□				1.5	2.0	3.5
Total									34.0	41.0	75.0

EXPENDITURE ESTIMATES FOR FLOOD CONTROL STUDY

		1st Year	2nd Year
Seg 2:	Unestablished Staff	$33,481	$36,829
Seg 3:	Travel & Telecom	$28,000	$30,800
Seg 4:	Maintenance & Operation	$40,000	$44,000
Seg 5:	Purchase of Goods & Services	$12,000	$13,200
	Total	$113,481	$124,829

NB Allowing 10% for increase of activities for the 2nd year.

Sec 2 Unestablished Staff

(a) Wages: ($24,869)

This provision is to cater for wages for unestablished staff especially the 4 Drivers who will be attached to the project to drive vehicles that will be specially allocated to them.

4 Drivers x 2.59p.h.	=	$23,703.68
Allowance of 5% for increase	=	$ 1,185.18
		$24,888.64

(b) Allowance: ($1,500)

Country and meal allowance for this 4 Drivers who will be required to start early or work late due to the work pattern of the project.

As this project will be centered in the Western Division most runs will be made to Suva where equipment/materials are readily available thus drivers have to sleep overnight.

(c) Overtime: ($5,000)

These are to cater for these Drivers as mentioned will be required to start early and knock-off late in order for the project to be completed as scheduled.

The use of vehicle is vital, thus overtime for Drivers is inevitable.

(d) FNPF: ($2,092)

To cater for FNPF contribution for the 4 unestablished staff Drivers.

$29,889 x 7% = $2,092

Sec 3 Travel and Telecommunication: ($28,000)

(a) Travel ($3,000)

The sum of $3,000 is required to meet travelling expenses for the Expertise and Established staffs attached to the project. Most of these staff are from Suva who will be required to travel to the Western Division where the center of the Project will be.

(b) Subsistence Allowance ($5,000)

This allowance is a must to meet meals and accomodation expenses for the staffs coming from Suva.

Also for meal allowance for Established staffs based at the Western Division when they are required to work late.

Close monitoring of this study will require more time thus staffs attached to the project will be required for an early start and late knock-offs.

(c) Telecommunication: ($20,000)

This is requested to cater for the telecommunication charges for the expertise while carrying this study. Overseas calls are anticipated for this 12 experts who will be attached to this project. Also in carrying out overseas shopping for sophisticated equipment they will be bringing along with them.

Accurate and timely reporting are essential for decision making.

Urgent data have to be obtained by telephone/fax lines

Sec 4 Maintenance and Operation: ($40,000)

(a) Vehicle Fuel: ($10,000)

The sum of $10,000 is to meet for the fuel and oil needs of the four (4) vehicles that will be used in this project as requested.

(b) Vehicle Spare Parts ($20,000)

To meet the spare parts and maintenance requirements for the four (4) vehicles that will be attached to the project.

The request is based on the long runs and increase of activities in the Western Division.

As this is a study programme where time factor is required, all vehicles need to be kept in a road worthy condition at all times.

The provision will also accommodate increasing costs of spare parts and accessories.

(c) Maintenance of Minor Equipment: ($10,000)

The provision is to meet for minor equipment servicing and repairs to sophisticated machines/equipment that this twelve (12) Japanese experts will be bringing along for the study

Sec 5 Purchase of Goods and Services: ($12,000)

(a) Books, Periodicals and Publication: ($2,000)

Engineering periodicals and books are required to be maintained for reports on study that will be carried out.

(b) Survey Requirements: ($2,000)

The provision will meet stationeries for surveys/study in the project.

Items will include all survey equipment to enable accurate and quick reporting for the completion of study on time as scheduled.

(c) Engineering Requirements: ($2,000)

The provision will meet the Engineers' needs in the purchase of support items like calculators, diaries etc. for proper and quick reporting due to time factor.

(d) Drafting Materials: ($2,000)

The provision will cater for drafting needs of the drafting personnel due to the increase in activity as this will be an added responsibility to their present work load.

(e) Office Requirements: ($2,000)

The provision will cater for the general office stationeries necessary to run the Project's administration.

(f) Protective Clothing: ($2,000)

The provision will cater for protective clothing for Established staffs and Japanese Experts who will be engaged in the project.

As most work will be out-door, they will need at least three (3) sets of boots/overalls to meet these work environment.

2. Scope of Work

SCOPE OF WORK
FOR
THE STUDY
ON
WATERSHED MANAGEMENT AND FLOOD CONTROL
FOR
THE FOUR MAJOR VITI LEVU RIVERS
IN
THE REPUBLIC OF FIJI

AGREED UPON BETWEEN
MINISTRY OF AGRICULTURE, FISHERIES, FORESTS AND ALTA
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

SUVA, FEBRUARY 14, 1996

N. Takawai

Mr. John Teaiwa
Permanent Secretary,
Ministry of Agriculture, Fisheries,
Forests and ALTA (MAFFA)

Mr. Shin Tsuboka
Leader of the Preparatory Study Team,
Japan International Cooperation Agency
(JICA)

I. INTRODUCTION

In response to the request of the Government of the Republic of Fiji (hereinafter referred to as "the Government of Fiji"), the Government of Japan has decided to conduct the Study on Watershed Management and Flood Control for the Four Major Viti Levu Rivers in the Republic of Fiji (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of the Government of Fiji.

The present document sets forth the scope of work with regard to the Study.

II. OBJECTIVES OF THE STUDY

The objectives of the Study are

1. to consolidate basic data and to formulate a master plan for watershed management and flood control for the four major Viti Levu Rivers (Nadi, Sigatoka, Ba, Rewa),
2. to conduct a feasibility study on urgent and/or priority project(s), and
3. to carry out technology transfer to the counterpart personnel of the Government of Fiji in the course of the Study.

III. STUDY AREA

The Study area shall cover the Viti Levu River Basins.

IV. SCOPE OF THE STUDY

In order to achieve the above objectives, the Study will cover the following items:

Phase 1: Consolidation of basic data and formulation of the master plan for watershed management and flood control

(1) Collection and review of existing data and information

(a) Topography
(b) Meteorology and hydrology
(c) River and river basin
(d) Existing facilities and measures related to flood control and drainage
(e) Flood mark and flood damage
(f) Existing flood forecasting and warning system
(g) Laws, regulations, policy and institutions related to the management of the river
(h) Water use
(i) Land use and vegetation
(j) Agriculture, fishery and forestry
(k) Environmental policy and guideline
(l) National and regional socio-economy
(m) Regional development plans and policies
(n) Soil Erosion
(o) Others

(2) Field reconnaissance

(a) Topography
(b) River and river basin
(c) Existing facilities and measures related to flood control and drainage
(d) Flood mark and flood damage
(e) Existing flood forecasting and warning system
(f) Draught damage
(g) Water use
(h) Land use
(i) Soil Erosion
(j) Watershed management
(k) Environment

(3) Field survey

(a) Meteorology and hydrology
(b) Geology and Soil
(c) Water quality

(d) Sediment discharge
(e) Profile and cross-section of the river
(f) Topography

(4) Study and Analysis
(a) Hydrological analysis
(b) Run-off analysis
(c) Clarification of flood mechanism
(d) Flood damage (inundated area and damage cost)
(e) Water balance analysis
(f) Sediment discharge
(g) Regional development trend in the future (socio-economy, agriculture, water use, land use etc.)

(5) Formulation of a master plan
(a) Structural measures
(b) Non-structural measures
(c) Cost estimation

(6) Initial Environmental Examination (IEE)

(7) Evaluation
(a) Economic and financial evaluation
(b) Selection of priority projects

Phase II : Feasibility study on urgent and/or priority project(s)

(1) Supplemental data collection and field survey
(2) Preliminary design of facilitie(s)
(3) Work execution plan
(4) Operation and maintenance plan
(5) Cost estimation
(6) Evaluation
(a) Environmental impact assessment (EIA)
(b) Social impact evaluation
(c) Economic and financial evaluation
(7) Implementation plan

V. SCHEDULE OF THE STUDY

The Study will be carried out in accordance with the tentative schedule attached in the Annex.

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VI. REPORTS

JICA shall prepare and submit the following reports in English to the Government of Fiji.

1. Inception Report:
   Twenty (20) copies at the beginning of the first work period in Fiji.

2. Progress Report (1):
   Twenty (20) copies at the end of the first work period in Fiji.

3. Progress Report (2):
   Twenty (20) copies at the end of the second work period in Fiji.

4. Interim Report:
   Thirty (30) copies at the beginning of the third work period in Fiji.

5. Progress Report(3):
   Twenty (20) copies at the end of the third work period in Fiji.

6. Draft Final Report:
   Twenty (20) copies within twenty three (23) months after the commencement of the Study.
   The Government of Fiji will present its comments to JICA within one (1) month after receipt of the Draft Final Report.

7. Final Report:
   Fifty (50) copies within two (2) months after JICA's receipt of the said comments on the Draft Final Report.

VII. UNDERTAKINGS OF THE GOVERNMENT OF FIJI

1. To facilitate the smooth implementation of the Study, the Government of Fiji shall take necessary measures:

   (1) to secure the safety of the Japanese Study Team,

   (2) to permit the members of the Study Team to enter, leave and sojourn in Fiji for the duration of their assignment therein, and to exempt them from foreign registration requirements and consular fees,

   (3) to exempt the members of the Study Team from taxes, duties and any other charges imposed on equipment, machinery and other materials brought into and out of Fiji for the implementation of the Study,

   (4) to exempt the members of the Study Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Study Team for their services in connection with the implementation of the Study,

   (5) to provide necessary facilities to the Team for remittance as well as utilization of funds introduced into Fiji from Japan in connection with the implementation of the Study,

   (6) to secure permission for entry into private properties or restricted areas for the implementation of the Study,

   (7) to secure permission for the Study Team to take all data and documents (including photographs and maps) related to the Study out of Fiji to Japan, and

   (8) to provide medical services as needed, expenses for which will be chargeable to the members of the Study Team.

2. The Government of Fiji shall bear claims, if any arise, against the members of the Study Team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Study Team.

3. For the smooth implementation of the Study, the Ministry of Agriculture, Fisheries, Forests and ALTA (hereinafter referred to as "MAFFA") shall act as a counterpart agency to the Study Team and the Ministry of Regional Development and Multi Ethnic Affairs (hereinafter referred to as "MRDMEA") as a coordinating body in relations with other governmental and non-governmental organizations concerned.

4. MAFFA shall, at its own expense, provide the Study Team with the following, in cooperation with other organizations concerned:

   (1) available data (including photographs and maps) and information related to the Study,

   (2) counterpart personnel,

   (3) suitable office space with necessary equipment and furniture in Suva,

   (4) credentials or identification cards, and

   (5) appropriate number of vehicles with drivers.

VIII. UNDERTAKINGS OF JICA

For the implementation of the Study, JICA shall take the following measures:

1. to dispatch, at its own expense, the Study Team to Fiji, and
2. to pursue technology transfer to the Fijian counterpart personnel in the course of the Study.

IX. CONSULTATION

JICA and MAFFA shall consult with each other in respect of any matter that may arise from or in connection with the Study.

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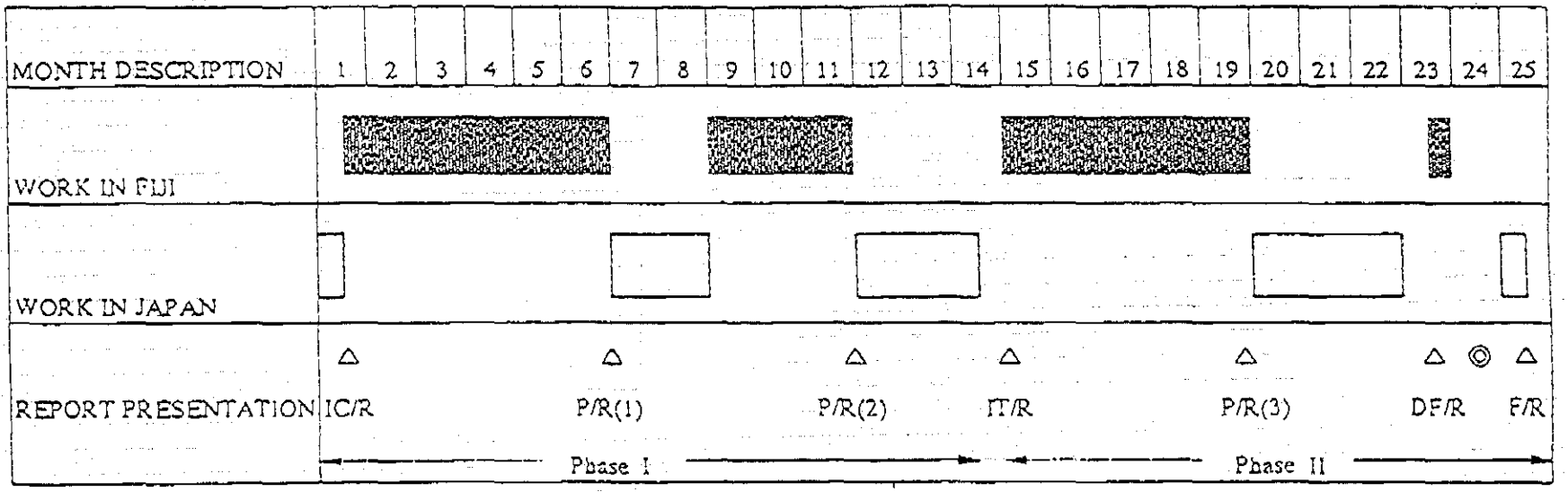
ANNEX

TENTATIVE WORK SCHEDULE



REMARKS:
- IC/R : Inception Report
- P/R : Progress Report
- IT/R : Interim Report
- DF/R: Draft Final Report
- F/R : Final Report
- ◎: comments from Fijian side

3. Minutes of Meeting

MINUTES OF MEETING
ON
SCOPE OF WORK
FOR
THE STUDY
ON
WATERSHED MANAGEMENT AND FLOOD CONTROL
FOR
THE FOUR MAJOR VITI LEVU RIVERS
IN
THE REPUBLIC OF FIJI

AGREED UPON BETWEEN
MINISTRY OF AGRICULTURE, FISHERIES, FORESTS AND ALTA
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

SUVA, FEBRUARY 14,1996

N. Teaiwa

Mr. John Teaiwa
Permanent Secretary,
Ministry of Agriculture, Fisheries,
Forests and ALTA (MAFFA)

津 壺 伸

Mr. Shin Tsuboka
Leader of the Preparatory Study Team,
Japan International Cooperation Agency
(JICA)

Introduction

Japan International Cooperation Agency (hereinafter referred to as "JICA"), at the official request of the Government of the Republic of Fiji (hereinafter referred to as "the Government of Fiji"), dispatched a Preparatory Study Team headed by Mr. Shin Tsuboka (hereinafter referred to as "the Preparatory Team"), from February 5th to February 19th, 1996, to discuss the Scope of Work for the Study on Watershed Management and Flood Control for the Four Major Rivers in the Republic of Fiji (hereinafter referred to as "the Study").

During the stay in Fiji, the Preparatory Team carried out field surveys of the study area, and had a series of discussions on the draft Scope of Work submitted by the Preparatory Team in the joint meeting with the authorities concerned in the Government of Fiji, namely the Ministry of Agriculture, Fisheries, Forests and ALTA (hereinafter referred to as "MAFFA") and the Ministry of Regional Development and Multi Ethnic Affairs (hereinafter referred to as "MRDMEA"). The list of attendants is shown in the Annex 1.

Through the intensive discussions, both sides agreed to adopt the Scope of Work with the following understandings.

1. Definitions

Both the Fijian side and the Preparatory Team confirmed the definitions of the technical terms in the Scope of Work as follows:

(1) In reference to II. 1 and IV. Phase I of the Scope of Work, "watershed management" includes water resources management, river management, environmental management, land use and conservation.

(2) In reference to IV. Phase I (1) (h) and (2) (g) of the Scope of Work, "water use" includes the use of domestic, agricultural and hydropower water.

(3) In reference to IV. Phase II of the Scope of Work, "urgent and/or priority project(s)" shall be selected at the end of the Phase I, i.e. master plan formulation, out of several projects identified in the master plan. The number of the priority projects for the feasibility study in the Phase II will depend on the scale and kinds of the projects.

2. Study Area

Both sides agreed that the study area in terms of necessary data collection and field reconnaissance shall cover the whole Viti Levu Island, while the target area for the master plan formulation shall be the four major river basins of Nadi, Sigatoka, Ba and Rewa.

3. Target Year of the Master Plan

Both sides agreed that the target year of the master plan shall be the year 2015.

4. Study Period

In reference to V. of the Scope of Work, both sides confirmed that because of the lack of hydrological data on the Nadi River, the Sigatoka River and the Ba River, extensive measurement of hydrological data on the three rivers is necessary, and this require longer work period in Fiji for Phase I. In this sense, both sides agreed to set the total study period to be 25 months as shown in the Annex of the agreed Scope of Work, instead of 22 months proposed in the draft Scope of Work.

5. Steering Committee

Both sides agreed to establish a steering committee for the smooth implementation of the Study. The committee will comprise representatives of the following ministries and authorities concerned of the Government of Fiji and be coordinated by MRDMEA,

(1) Ministry of Agriculture, Fisheries, Forests and ALTA (MAFFA)
    Dept. of Drainage and Irrigation (D&I)
    Dept. of Forest (DOF)
    Dept. of Extension (DOE)
(2) Ministry of Regional Development and Multi Ethnic Affairs (MRDMEA)
(3) Ministry of Fijian Affairs
    Native Land Commission
    Native Land Trust Board
    Fijian Administration
(4) Ministry of Infrastructure
    Public Work Dept. (PWD)

(5) Ministry of Land, Mineral Resources, Environment and Energy
Dept. of Land and Surveys
Dept. of Mineral Resources
Dept. of Environment
Dept. of Energy
(6) Ministry of Finance and Economic Development (MFED)
Central Planning Office (CPO)

6. Divisional/District Coordinating Committee

Both sides agreed to establish a divisional/district coordinating committee to take into account the ideas and intentions of the people living in the project area. The committee shall consist of the representatives of the people, and the 6 (six) ministries concerned of the Government of Fiji, and the Japanese full-scale study team (observer). The committee shall be held when necessary on the course of the Study.

7. Counterparts

The Preparatory Team requested the nomination of the counterpart personnel in 18 fields. Accordingly, the Fijian side submitted a list of the counterpart personnel as attached in the Annex 2, and assured that these counterpart personnel will be provided as soon as the full-scale study team is dispatched.

8. Final Report

The Preparatory Team explained that, as a JICA's policy, the final report of the Study shall be open to the public in Japan in principle after the completion of the Study. The Fijian side agreed on this point.

9. Undertakings

(1) The Preparatory Team requested and the Fijian side agreed to provide the suitable office space with telephones and furnitures in Suva. The Fijian side also offered to provide working space with telephones and furnitures in the Nadi, the Sigatoka and the Ba River basins.

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(2) The Fijian side requested 6 (six) vehicles for the counterpart team to be provided by JICA. The Preparatory Team replied to convey the request to the JICA Headquarters.

10. Equipments

The Fijian side requested provision of the equipment listed in the Annex 3 for the Study. The Preparatory Team took note of the request.

11. Counterpart training

The Fijian side requested the Preparatory Team that JICA accept counterparts for technical training in Japan. The Preparatory Team replied to convey the request to the JICA Headquarters.

12. Technical Seminar

The Fijian side requested the Preparatory Team that JICA hold a technical seminar as a part of technical transfer in the course of the Study. The Preparatory Team replied to take it into consideration.

13. Dispatch of Long Term Expert

The Fijian side requested the Preparatory Team that JICA dispatch a long term Japanese Expert in the field of flood control and watershed management. The Preparatory Team replied to convey the request to the JICA Headquarters, though the request should be communicated and discussed through an appropriate diplomatic channel.

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ANNEX 1

ATTENDANTS LIST

1. Fijian Side

[Ministry of Regional Development and Multi Ethnic Affairs (MRDMEA)]

Mr. Luke Ratuvuki	Permanent Secretary
Mr. Poasa.Ravea	Deputy Secretary
Mr. Sakenasa Varea	Disaster Manager

[Ministry of Agriculture, Fishery and Forestry (MAFFA)]

Mr. Niumaia Tabunakawai	Deputy Permanent Secretary
Mr. Hari D. Sharma	Director of Drainage and Irrigation (D&I)
Mr. Satya N. Swami	Principal Engineer, Dept. of Drainage and Irrigation (D&I)
Mr. Etuate Basaga	Senior Forestry Officer/Licensing, Dept. of Forestry (DOF)

[Ministry of Finance and Economic Development (MFED)]

Mr. Aisake Taito	Senior Planning Officer, Central Planning Office (CPO)

[National Land Trust Board (NLTB)]

Mr. Seva Tabua	Senior Landuse Planner

2. Japanese Side

[Preparatory Study Team]

Mr. Shin Tsuboka	Team Leader
Mr. Kenzo Hiroki	Member
Mr. Hideki Tanabe	Member
Mr. Nobuyuki Okabe	Member
Mr. Akira Kadoya	Member

[Embassy of Japan]

Mr. Yasuhiro Tojo	Second Secretary

[JICA Fiji Office]

Mr. Takayuki Jimbo	Assistant Resident Representative
Mr. Stanley Hancock	Research Associate

ANNEX 2

COUNTERPART LIST

	Necessary Field	Counterpart Organization	Explanation	Name	Official Designation
1	Team Leader / River Basin Management	MAFFA	Chief Counterpart	Niumaia Tabunakawai	Deputy Permanent Secretary (Services)
2	River Basin Management	D&I	Vice Chief Counterpart	Satya N. Swami	Principal Engineer
3	River Planning	D&I	including flood control	K. M. Cho	Senior Engineer
4	Water Resources Development	PWD	including database	Rishi Raj	Senior Hydrologist
5	Meteorology and Hydrology			Rajendra Prasad	Director of Meteorology
6	Hydraulics / Hydrology	PWD	including groundwater	Shandil	Director of Water and Sewerage
7	Geology	Dept. of Mineral Resources	including structural foundation	Prem Kumar	Principal Geologist
8	Soil Erosion and Sedimentation Control	DOF		Laikini Jiko	Deputy Conservator of Forest
9	Water Quality	Dept.. of Environment		Sefa Nawadra	Senior Environment Officer
10	Low Water Management	D&I		Shabnam Yee	Engineer (Design / Environmental)
11	Forestry Management	DOF		Etuate Basaga	Senior Forestry Officer
12	Regional Development	MRDMEA		Luke Ratuvuki	Permanent Secretary
13	Survey	D&I		T. Wacokecoke	Senior Surveyor
				Bram Deo	Surveyor
14	Environment	Dept. of Environment	natural environment	Sefa Nawadra	Senior Environment Officer
15	Flood Control Facility Planning	D&I	including landuse	Inoke Ratukalou	Senior Research Officer - Landuse
				M. M. Mymt	Senior Engineer
16	Cost Estimation and Work Planning	D&I		Satya N. Swami	Principal Engineer
		PWD		Taito Delana	Senior Engineer
17	Socio-economy	CPO	financial and economical analysis	Aisake Taito	Senior Planning Officer
				R. Ram	Senior Planning Officer
18	Hydropower Development	Dept. of Energy		Rohit C. Autar	Senior. Energy Analyst

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EQUIPMENT REQUIREMENTS

The following equipment are required for watershed management project as shown below:

ITEM	QTY
- 4 wheel drive vehicles	6
- Automatic Rainfall recorders	10
- Automatic water level recorders	9
- Current meters	4
- Water level recorder (Float type)	10
- Lightwave Distancer (Electronic Distance Measuring Instrument)	2
- Theodolites with accessories (total station)	3
- Automatic levels with staff	8
- Sediments Samplers	9
- Computer 486 & monitor with CD Rom Drive	4
- Computer printers	4
- Photocopier	2
- Plan printers	2
- Planimeters	4
- Draughting Tables	4
- Echo sounders	6
- Computer plotter	1
- Scanner	1
- Digitizer	1
- Walkie Talkie (Range 10km)	10 sets
- Computer software (English Version)	
(a) Mathematical Modelling of flood Routing 2 or 3 dimension - tidal rivers	1
(b) Rain fall run off (catchment Modelling)	1
(c) Sediment transport	1
(d) Survey software	1
- Binoculars	4
- Water Quality Measuring Equipment DO, pH, EC & Turbidity	1
- Video Camera	1
- Video Deck and Screen	1
- Cameras	2
- Overhead projector & screen	1
- Slide projector	1
- Computer Notebook (English - DOS)	2

4．Questionaire 及び調査結果

QUESTIONNAIRE FOR DATA AVAILABILITY
FOR
THE STUDY ON WATERSHED MANAGEMENT AND FLOOD CONTROL
FOR
THE FOUR MAJOR VITI LEVU RIVERS
IN
THE REPUBLIC OF FIJI

ITEM	AVAILABILITY	SOURCE	REMARKS
1. TOPOGRAPHY AND GEOLOGY			
1-1. Topographic maps covering the study area		Dept. of Lands and Surveys	
a. Area covered by the above maps	Yes		Viti Levu （全16枚購入）
b. Scale	1:50,000		
c. Interval of contour line	20 m		
d. Agency and administrative office	Dept. of Lands and Surveys		
1-2. Aerophotographs (the latest photos)		Dept. of Lands and Surveys	サンプル写真購入 1990版（１枚） 1994版（３枚）
a. Area covered by the above aerophotographs	Yes		
b. Scale	1:16,000		1:50,000
c. Photographing year	1990		1994
d. Agency and administrative office			
e. Control point (location and altitude)	Yes (1982, 1984, 1986)		No (1990, 1994)
f. Triangulation station	560 stations		
g. Permission for the Study Team to take them out of the Fiji to Japan	Yes		Mr. Ramesh Bhai (Air Survey)

ITEM	AVAILABILITY	SOURCE	REMARKS
1-3. River plan, profile and cross-section		D&I	
a. Plan, profile and cross-section of existing river	Yes		Ba, Nadi and Rewa River
b. Agency and administrative office	D&I		
1-4. Geological maps covering the study area		Dept. of Mineral Resources	
a. Area covered by the above maps	Yes		
b. Scale	1:50,000		Viti Levu（全22枚）
c. Agency which prepared map/administrative office	Dept. of Mineral Resources and SOPAC		
1-5. Land use maps covering the study area	Yes	D&I	
a. Scale	1:126,726		Ba and Rewa River
b. Year of publication or investigation	1986		Watershed Management Study (FAO)
c. Agency and administrative office	Landuse Section (MAFFA)		
1-6. Soil-mechanical data (boring log data) at major river structure	Yes	PWD	Ba Bridge
2. CLIMATIC AND HYDROLOGICAL DATA			
2-1. Location map of climatological and hydrological observatories in and around the study area	Yes		
a. Climatological and precipitation stations		Meteorological Services and PWD	
b. Hydrological gauging stations (water level and discharge)		PWD	
c. Tide stations		Port Authority of Fiji (PAF) and Harbour Master	Suva and Lautoka Harbour

ITEM	AVAILABILITY	SOURCE	REMARKS
2-2. List of aforementioned stations showing	Yes	Meteorological Services, PWD and PAF	
a. Station name			
b. Location/address			
c. Classification of observatory or code No., if any			
d. Observation items indicating equipment in use			
e. Period of observation			
f. Authorities concerned	Meteorological Services, PWD and PAF		
2-3. General climatic conditions in term of monthly average at major climatological stations, to be compiled in an attached Form-1	Yes	Meteorological Services	
2-4. Specific climatic conditions ever recorded at major stations, to be compiled in an attached Form-2	No		
2-5. Hyetograph of storm which caused major historical floods in and around the study area	Yes	Meteorological Services and PWD	
a. Hourly distribution of storm rainfall at major stations			
b. Hourly hydrograph of flood flow at major stations			
c. Isohyetal maps			
2-6. Annual maximum daily rainfall, together with the date of occurrence, recorded at major stations in recent 30 years, to be compiled in an attached Form-3	Yes	Meteorological Services	

ITEM	AVAILABILITY	SOURCE	REMARKS
2-7. Water levels and discharges	Yes	PWD and PAF	
a. Monthly average discharges at major non-tidal river gauging stations, to be compiled in an attached Form-4			
b. Annual maximum water level and discharge, together with the date of occurrence, recorded at major stations in recent 30 years, to be compiled in an attached Form-5			
c. Water level and discharge hydrographs observed during major floods in the past			
d. Authorized drainage areas at major points of flood control			
e. Equation and/or curve showing relationship between water level and discharge (for water level to discharge conversion)			
f. Tidal water level recorded at major tide stations, to be compiled in an attached Form-6			
2-7. Sediment observation record	Yes	D&I and PWD	
a. River bed materials analysis			D&I: Ba River PWD: Nadi, Rewa and Sigatoka R.
b. Particle size distributions of bed materials			〃
c. Sediment volume of bed load and suspensions load (data obtained from observation)			
3. FLOOD CONTROL AND RELEVANT INFORMATION			
3-1. Record or information on the past flood damage in the study area	Yes	PWD	
a. occurrence year			
b. Cause			
c. Inundation area and damage on the farm land and propertied.			

ITEM	AVAILABILITY	SOURCE	REMARKS
d. Damage on the flood control facilities and other infrastructure facilities such as bridges, roads and irrigation weirs			
e. Extent of damage			
3-2. Present conditions of existing flood control facilities in the study area	No		
3-3. Information regarding the completed/on-going/proposed flood control projects in and around the study area covering project name, title and contents of project reports (UNDP, FAO, ADB etc.)	Yes		
3-4. Information regarding the completed/on-going/proposed river intake structures in the study area covering project name, title and contents of project reports	No		Rewa River (Pumping Station)
3-5. Existing flood warning/evacuation system in the study area	Yes	DISMAC (Disaster Management Committee, MRDMEA)	
3-6. Land conservation of the study area	Yes		
a. Forestation		Dept.of Forestry and Landuse Section, MAFFA	
b. Erosion control		Landuse Section, MAFFA	
c. Record of landslides		Landuse Section, MAFFA	
3-7. Design and Standard which is being applied to flood control project	No		

ITEM	AVAILABILITY	SOURCE	REMARKS
4. ENVIRONMENT			
4-1. Legislation		Dept. of Environment	
a. Do you have the law/guidelines on environmental impact assessment? Please attach the detail, e.g. responsible ministry or agency, procedure, if any.	Yes		Under formulation (Fiji's Sustainable Development Act) (authorized : end of 1996 or 1997)
b. Do you have the environmental quality standard(s)? Please attach the detail, e.g. values, penalties, if any.	No		
4-2. International Conventions on Environmental Conservation Have you affiliated to bilateral or multilateral convention(s) concerning environmental conservation, e.g. Ramsar Convention, Washington Convention? Give the name(s) of the convention(s) affiliated and the date of affiliation, if any.	Yes	Dept. of Environment	21 International Environmental and Resource Management Conventions
4-3. Present situation of the proposed project site			
a. Socio-economic Environment	Yes	MRDMEA	District Officer
- Number of people to be resettled and plan of resettlement or compensation			
- Experience of resettlement in previous projects, if any			
- Number and distribution of schools, hospitals, religious facilities			
- Location of the community which will be split by the project, if any			
- Cultural property or archaeological sites, if any			
- Use of spring/river/lake/sea water, i.e. domestic, industrial and agricultural		PWD and D&I	
- Existence of common land		Native Land Trust Board	
- Solid waste collection and disposal system		City & Town Council	

ITEM	AVAILABILITY	SOURCE	REMARKS
b. Natural Environment	Yes		
- Availability of vegetation map		Landuse Section, MAFFA	
- History of natural disaster such as landslide, high tide, earthquake and flood		MRDMEA, Dept.of Mineral Resources and PWD	
- Change of water level of rivers and lakes in recent years		PWD	
- Location of environmentally vulnerable areas such as mangrove forest, coral reef, wet land, tideland, if any		Environment Dept.	
-Availability of oceanological data such as littoral drift, oceanological map		Mineral Resources Dept. and SOPAC	
- Species of valuable animals and plants in the area, if any		Environment Dept.	The National Environment Strategy (Fiji), April 1993
- Location of particular areas officially protected such as nationals parks and natural parks		〃	
- Distribution of important landscape or scenery for tourism or religion		〃	
c. Environmental Pollution	Yes	PWD and Environment Dept.	
- Present water quality			
- Regulation on effluent			
- Present conditions of noise and vibration			
- Regulation for prevention of noise and vibration			

ITEM	AVAILABILITY	SOURCE	REMARKS
5. OTHERS			
5-1. List of Consultant Firms in Fiji which specialize in Survey, Water quality analysis, Flood control and Environmental assessment	Yes	D&I	
a. Survey, geology and aerophotograph			
b. Water quality			
c. Hydrology and hydraulics			
d. Environmental assessment			
5-2. Unit price and wages of local consultants, technical and supporting staff, typist, driver and workers	Yes	D&I	

5．主要収集資料リスト

収集資料リスト

資　料　の　名　称	オリジナル／コピーの別	収集先名称又は発行機関
国家開発計画		
- MEDIUM TERM CAPITAL EXPENDITURE PROGRAMME A three year rolling programme for investment by the Government of Fiji Report for the period 1995 to 1997	オリジナル	JICAフィジー事務所
関係機関の組織図等		
- GOVERNMENT DEPARTMENTS	コピー	D&I
- Ministry of Agriculture, Fisheries, Forests and ALTA の組織図 (May 1995)	コピー	〃
- Hydrology Section (PWD) の組織図	コピー	PWD
地形図		
- FIJI ISLANDS (1:750,000)	オリジナル	Dept. of Lands and Survey
- VITI LEVU (SHEET 4 : 1:250,000)	オリジナル	〃
- FIJI MAP INDEX (1:50,000)	オリジナル	〃
- TOPOGRAPHIC MAP 1:50,000 (SHEET L26: VOMO)	オリジナル	〃
TOPOGRAPHIC MAP 1:50,000 (SHEET L27: LAUTOKA)	オリジナル	〃
TOPOGRAPHIC MAP 1:50,000 (SHEET L28: MOMI)	オリジナル	〃
TOPOGRAPHIC MAP 1:50,000 (SHEET L29: SIGATOKA)	オリジナル	〃
TOPOGRAPHIC MAP 1:50,000 (SHEET M26: BA)	オリジナル	〃
TOPOGRAPHIC MAP 1:50,000 (SHEET M27: BALEVUTO)	オリジナル	〃
TOPOGRAPHIC MAP 1:50,000 (SHEET M28: KEIYASI)	オリジナル	〃
TOPOGRAPHIC MAP 1:50,000 (SHEET M29: KOROLEVU)	オリジナル	〃
TOPOGRAPHIC MAP 1:50,000 (SHEET N26: RAKIRAKI)	オリジナル	〃
TOPOGRAPHIC MAP 1:50,000 (SHEET N27: MONASAVU)	オリジナル	〃
TOPOGRAPHIC MAP 1:50,000 (SHEET N28: NAMOSI)	オリジナル	〃
TOPOGRAPHIC MAP 1:50,000 (SHEET N29: NAVUA)	オリジナル	〃
TOPOGRAPHIC MAP 1:50,000 (SHEET 026: VATU-I-RA)	オリジナル	〃
TOPOGRAPHIC MAP 1:50,000 (SHEET 027: KOROVOU)	オリジナル	〃
TOPOGRAPHIC MAP 1:50,000 (SHEET 028: NAUSORI)	オリジナル	〃
TOPOGRAPHIC MAP 1:50,000 (SHEET 029: SUVA)	オリジナル	〃
- List of Maps available and prices	コピー	〃

深度図及び地震震央位置図

- BATHYMETRIC MAP OF FIJI (with shallow seismicity) (1:1,000,000)	ｵﾘｼﾞﾅﾙ	Dept. of Mineral Resources

航空写真

- Aerial Photographs 1:16,000 (1990)	ｵﾘｼﾞﾅﾙ	Dept. of Lands and Survey
・AAM 1937 VITI LEVU, RUN 9W		
- Aerial Photographs 1:50,000 (1994)	ｵﾘｼﾞﾅﾙ	〃
・AAM 2069 VITI LEVU, RUN 13		
・AAM 2067 VITI LEVU, RUN 14		
・AAM 2067 VITI LEVU, RUN 15		

地質関係資料

- Geological Studies in Southwest Viti Levu, Memoir 1, 1964	ｵﾘｼﾞﾅﾙ	Dept. of Mineral Resources
- Geology of East and North-East Viti Levu (Explanation of Viti Levu Sheets No. 3, 7, 8, 13, 14) Bulletin 12, 1965	ｵﾘｼﾞﾅﾙ	〃
- GEOLOGY OF NANUKULOA AREA (VITI LEVU SHEET 3: 1:50,000 SERIES)	ｵﾘｼﾞﾅﾙ	〃
- GEOLOGY OF WAINIMBUKA RIVER AREA (VITI LEVU SHEET 7: 1:50,000 SERIES)	ｵﾘｼﾞﾅﾙ	〃
- GEOLOGY OF LONDONI AREA (VITI LEVU SHEET 8: 1:50,000 SERIES)	ｵﾘｼﾞﾅﾙ	〃
- GEOLOGY OF VUNINDAWA AREA (VITI LEVU SHEET 13: 1:50,000 SERIES)	ｵﾘｼﾞﾅﾙ	〃
- GEOLOGY OF NANDURULOULOU AREA (VITI LEVU SHEET 14: 1:50,000 SERIES)	ｵﾘｼﾞﾅﾙ	〃
- HYDROGEOLOGICAL MAP OF VITI LEVU (1:250,000)	ｵﾘｼﾞﾅﾙ	〃
- PRICE LIST (GENERAL PUBLIC), 18 January 1995	ｺﾋﾟｰ	〃

土地利用

- PRESENT AND POTENTIAL LAND USE MAP (VITI LEVU) 1:126,720	ｺﾋﾟｰ	Landuse Section, MAFFA

ボーリング結果に関する資料

- Ba Bridge, Viti Levu, Fiji-Ground Investigation	ｺﾋﾟｰ	D&I

気象関係資料

- FIJI METEOROLOGICAL SERVICE DISTRIBUTION OF METEOROLOGICAL STATIONS 1995	ｺﾋﾟｰ	Meteorological Services
- Weather Surveillance Radar Coverage	ｺﾋﾟｰ	〃
- FIJI METEOROLOGICAL SERVICE - AREAS OF RESPONSIBILITIES	ｺﾋﾟｰ	〃
- GLOBAL NETWORK OF TROPICAL CYCLONE WARNING SYSTEMS	ｺﾋﾟｰ	〃
- Outline of Facilities and Equipment	ｺﾋﾟｰ	〃
- RAINFALL AND CLIMATE STATION IN FIJI (2 DECEMBER 1981)	ｺﾋﾟｰ	〃
- Rainfall and Climate Station in Fiji (22 December 1983)	ｺﾋﾟｰ	〃
- INDEX OF INFORMATION SHEETS (1 October 1984)	ｺﾋﾟｰ	〃
- AVERAGE RAINFALL AT FIJI STATIONS	ｺﾋﾟｰ	〃
- LIST OF TROPICAL CYCLONES AFFECTING FIJI BETWEEN 1840 TO AND APRIL 1993	ｺﾋﾟｰ	〃
- MAP FOR PLOTTING TROPICAL CYCLONE TRACK TROPICAL CYCLONES AFFECTING FIJI ・ JAN 1970 - DEC 1979 ・ JAN 1980 - JAN 1989 ・ JAN 1990 - APR 1994	ｺﾋﾟｰ	〃
- TROPICAL CYCLONE REPORT 92/1 TROPICAL CYCLONE KINA: 26 December 1992 to 5 January 1993	ｺﾋﾟｰ	〃
- ROUTES OF MAJOR CYCLONES PASSING THROUGH FIJI	ｺﾋﾟｰ	〃
- CLIMATOLOGICAL SUMMARY : RARAWAI - BA RIVER	ｺﾋﾟｰ	D&I
- Daily Climatological Observations (JUNE 1995) Station: SUGARCANE RESEARCH CENTRE, F-S-C LTD, RARAWAI	ｺﾋﾟｰ	〃

水文・水理関係資料

- 水位観測所位置図	ｵﾘｼﾞﾅﾙ	PWD
- 水位観測所一覧リスト	ｺﾋﾟｰ	〃

- Hydrology of the Rewa and Ba Watersheds TERMINAL REPORT (DRAFT) FOR THE PROJECT OF WATERSHED MANAGEMENT STUDY, FIJI, PROJECT FINDINGS AND RECOMMENDATIONS, Fij/86/001	ｺﾋﾟｰ	D&I
- 水位流量曲線に関する資料 ・ Rewa River at Nausori Bridge ・ Ba River at Ba Bridge ・ Calibration Table of Current Meter (OSS-B1)	ｺﾋﾟｰ	〃
- 年最高流量の確率評価検討資料 (Rewa River at Nausori Bridge)	ｺﾋﾟｰ	〃
- RORB - VERSION 4, RUNOFF ROUTING PROGRAM : USER MANUAL, MONASH UNIVERSITY, Department of Civil Engineering, May 1990	ｺﾋﾟｰ	〃
- HSFR - Version 3.0, MULTI-CHANNEL FLOOD ROUTING MODEL : USER MANUAL, December 1990	ｺﾋﾟｰ	〃
- 粒度分析に関する資料 ・ Particle size analysis results ・ Sieve analysis and bulk density test	ｺﾋﾟｰ	〃
- 水文観測機器のカタログ	ｺﾋﾟｰ	〃
TERMINAL REPORT (DRAFT) FOR THE PROJECT OF RIVER IMPROVEMENT MASTER PLAN, FIJ/88/002 に関する資料		
- TECHNICAL REPORTS ・ Inception and First Quarter Progress Report, January 1990 ・ Assessment of Data Requirements for Numerical Flood Modelling of the Rewa River, Fiji, May 1990 ・ HYDSYS : Timer Series Database Management, May 1990 ・ Note on Discharge Observation by Moving Boat Method, June 1990 ・ Investigation of Assets in Flood Prone Area, June 1990 ・ A Proposal for Qaraniki Intake Structure, September 1990	ｺﾋﾟｰ	D&I

• Monitoring Programme, Rewa River System for 1990-91 Flood Season, October 1990	ｺﾋﾟｰ	D&I
• Geo-morphological Study on Erosion of Lower Rewa River, December 1990		
• Stream Gauging Procedures with Emphasis on Practical Application for RIMP, January 1991		
• Reconnaissance Report : Namata Dam, February 1991		
• Sedimentation and Dredging Problems Faced in Viti Levu, Fiji Islands, April 1991		
• Proposed Follow-up Programme for Erosion Monitoring in Lower Rewa Reaches, May 1991		
• Monitoring Programme, Rewa River System for 1991-92 Flooding Season, October 1991		
• Sediment Monitoring in the Rewa River System, March 1992		
• Hydrological Monitoring Programme, Rewa River System for 1992-93 Flooding Season, August 1992		
• Annotations on "The Dublin Statement on Water and Sustainable Development" in relation with "Programme on Water and the Environment" in Fiji, January 1993		
• Rewa River Coastal/Estuarine Process Study Plan, June 1993		

浚渫事業に関する資料

- LAYOUT PLAN OF REWA RIVER MAINTENANCE DREDGING (NADALI), 1995	ｺﾋﾟｰ	D&I
- CROSS SECTION 27/00-28/300 OF REWA RIVER (NADALI) MAINTENANCE DREDGING 1995	ｺﾋﾟｰ	〃
- CROSS SECTION 28/400-30/00 OF REWA RIVER (NADALI) MAINTENANCE DREDGING 1995	ｺﾋﾟｰ	〃
- BA RIVER ENGINEERING PROJECT STATUS BRIEFING, JANUARY - 1996	ｺﾋﾟｰ	〃
- PROPOSED DESIGN DREDGE CHANNEL FROM CROSS SECTION OF LINE 9/+00 - 10/+00	ｺﾋﾟｰ	〃

排水／灌漑関係資料

- VITI LEVU DRAINAGE MAP SHOWING DRAINAGE BOUNDARIES & PROJECT AREAS, DRAINAGE AND IRRIGATION DIVISION, MINISTRY OF PRIMARY INDUSTRIES	ｺﾋﾟｰ	D&I

農林関係資料

- AGRICULTURAL STATISTICS [Part One] 1990-1994	ｵﾘｼﾞﾅﾙ	Economic Planning and Statistics Division, MAFFA
- SIGATOKA RESEARCH STATION ·History, Location and Climate, Staff, Information, etc.	ｺﾋﾟｰ	D&I
- SIGATOKA, BA AND NADI RIVERS CATCHMENTS: FORESTRY BRIEF	ｺﾋﾟｰ	〃
- FIJI National Code of Logging Practice, Protect your Forests, 1990, MINISTRY OF FORESTS	ｵﾘｼﾞﾅﾙ	〃
- BRIEFING NOTES - RARAWAI MILL: JICA VISIT ON 12 FEB 96	ｺﾋﾟｰ	RARAWAI MILL

電力に関する資料

- THE POWER AND THE PROMISE : ELECTRIFICATION IN FIJI	ｵﾘｼﾞﾅﾙ	Fiji Electricity Authority (FEA)
- Monasavu : HYDRO-POWER FOR FIJI	ｵﾘｼﾞﾅﾙ	〃
- FEA : ANNUAL REPORT 1985	ｵﾘｼﾞﾅﾙ	〃
- FEA : ANNUAL REPORT 1988	ｵﾘｼﾞﾅﾙ	〃
- FEA : ANNUAL REPORT 1989	ｵﾘｼﾞﾅﾙ	〃
- FEA : ANNUAL REPORT 1990	ｵﾘｼﾞﾅﾙ	〃
- FEA : ANNUAL REPORT 1991	ｵﾘｼﾞﾅﾙ	〃
- FEA : ANNUAL REPORT 1992	ｵﾘｼﾞﾅﾙ	〃
- FEA : ANNUAL REPORT 1993	ｵﾘｼﾞﾅﾙ	〃
- FEA : ANNUAL REPORT 1994	ｵﾘｼﾞﾅﾙ	〃

水道に関する資料

- ALTERNATIVE FUTURE SOURCES (Suva, Rewa River)	ｺﾋﾟｰ	PWD
- SIGATOKA REGIONAL WATER SUPPLY SCHEME MASTER PLAN	ｺﾋﾟｰ	〃
- PROPOSED ADDITIONS TO THE WATER SUPPLY SYSTEM (Ba River)	ｺﾋﾟｰ	〃

UNDP 関係資料

- STUDY INTO CYCLONE KINA AND ITS CONSEQUENCES IN FIJI	ｺﾋﾟｰ	UNDP
- STRENGTHENING ENGINEERING DESIGN CAPABILITIES - FIJI (AG:DP/FIJ/87/005, Terminal Report) PROJECT FINDINGS AND RECOMMENDATIONS, 1991	ｺﾋﾟｰ	〃
- RIVER IMPROVEMENT MASTER PLAN - FIJI (AG:DP/FIJ/88/002, Terminal Report) PROJECT FINDINGS AND RECOMMENDATIONS, 1994	ｺﾋﾟｰ	〃
- PROJECT IMPACT ASSESSMENT OF UNDP/FAO SOUTH PACIFIC : FORESTRY DEVELOPMENT PROGRAMME (RAS/92/361)	ｺﾋﾟｰ	〃
- ENVIRONMENT AND NATURAL RESOURCES : SOUTH PACIFIC DISASTER REDUCTION	ｺﾋﾟｰ	〃
- WATER CATCHMENT AS A MANAGEMENT UNIT ? FIJI GIS/RS User Group Meeting, 10 October, 1995	ｺﾋﾟｰ	〃

FAO 関係資料

- FAO Trust Funds	ｵﾘｼﾞﾅﾙ	FAO
- FAO Annual review A summary of the Organization's activities during 1992	ｵﾘｼﾞﾅﾙ	〃
- the value of forests	ｵﾘｼﾞﾅﾙ	〃
- FAO and Forestry に関する資料の抜粋	ｺﾋﾟｰ	〃
- The role of FAO	ｺﾋﾟｰ	〃
- FAO contact, MAY 1995	ｺﾋﾟｰ	〃
- Watershed Management on Island of the South Pacific : Tonga, Cook Islands, Pohnpei (Federated States of Micronesia) and Palau: Field Document No. 5, November 1994	ｵﾘｼﾞﾅﾙ	〃
- Proceedings of Heads of Forestry Meeting 1993 20-24 September, Nadi, Fiji "What Value Forests and Trees": Field Document No. 6, August 1995	ｵﾘｼﾞﾅﾙ	〃
- SANDALWOOD SEED NURSERY AND PLANTATION TECHNOLOGY PROCEEDINGS OF A REGIONAL WORKSHOP FOR PACIFIC ISLAND COUNTRIES, 1-11 AUGUST 1994, NOUMÉA, NEW CALEDONIA: Field Document No. 8, August 1995	ｵﾘｼﾞﾅﾙ	〃

- PROCEEDINGS OF THE 2nd REGIONAL WOMEN'S TRADITIONAL MEDICINE WORKSHOP organized by SPACHEE, FIJI FORESTRY & UNDP/FAO SPFDP, 3-7 APRIL 1995, NDDAVE, FIJI: Field Document No. 9, JULY 1995	ｵﾘｼﾞﾅﾙ	FAO
- Pacific Islands: FORESTS & TREES, No. 1/94, March 1994 (1994 HoF Meeting in July)	ｺﾋﾟｰ	〃
- Pacific Islands: FORESTS & TREES, No. 2/94, June 1994 (1994 Regional Agroforestry Workshop for Atoll Environments)	ｵﾘｼﾞﾅﾙ	〃
- Pacific Islands: FORESTS & TREES, No. 3/94, September 1994 (1994 Heads of Forestry Meeting)	ｵﾘｼﾞﾅﾙ	〃
- Pacific Islands: FORESTS & TREES, No. 4/94, December 1994 (TOWARDS A COMMON CODE OF LOGGING PRACTICE)	ｵﾘｼﾞﾅﾙ	〃
- Pacific Islands: FORESTS & TREES, No. 1/95, March 1995 (Towards Closer Coordination & Collaboration-Updating Directory of Oceania Forest Sector)	ｵﾘｼﾞﾅﾙ	〃
- Pacific Islands: FORESTS & TREES, No. 2/95, June 1995 (1995 HEADS OF FORESTRY MEETING)	ｵﾘｼﾞﾅﾙ	〃
- Pacific Islands: FORESTS & TREES, No. 3/95, September 1995 (NATURAL FOREST MANAGEMENT & LOGGING WORKSHOP)	ｵﾘｼﾞﾅﾙ	〃
- Pacific Islands: FORESTS & TREES, No. 4/95, December 1995 (1995 HEADS OF FORESTRY MEETING)	ｵﾘｼﾞﾅﾙ	〃
SOPAC 関係資料 (SOUTH PACIFIC APPLIED GEOSCIENCE COMMISSION)		
- SOPAC の概要（邦文：細井義孝氏作成）	ｺﾋﾟｰ	SOPAC
- ANNUAL REPORT, SUMMARY, 1994	ｵﾘｼﾞﾅﾙ	〃
- LIST OF PUBLICATIONS AND REPORTS from April 1975 to September 1995, Suva, September 1995	ｺﾋﾟｰ	〃

環境関係資料

- FIJI'S SUSTAINABLE DEVELOPMENT BILL (Working Document and Consultation Paper), Working Draft - 17/11/95	ｺﾋﾟｰ	D&I
- THE NATIONAL ENVIRONMENT STRATEGY (FIJI), 1993	ｵﾘｼﾞﾅﾙ	〃
- ENVIRONMENT IMPACT STATEMENT DRAINAGE AND IRRIGATION DIVISION, MINISTRY OF AGRICULTURE, FISHERIES, FORESTS AND ALTA "BA RIVER DREDGE SPOIL DEPOSITION AT NATOGO MUDFLATS"	ｺﾋﾟｰ	〃
- ENVIRONMENT IMPACT STATEMENT DRAINAGE AND IRRIGATION DIVISION, MINISTRY OF AGRICULTURE, FISHERIES, FORESTS AND ALTA "BA RIVER DREDGE SPOIL DEPOSITION AT SAGUNU TIRI LAND"	ｺﾋﾟｰ	〃
- FORMAT OF AN ENVIRONMENTAL IMPACT ASSESSMENT (STATEMENT)	ｺﾋﾟｰ	〃

その他

- Fiji Today 1994	ｵﾘｼﾞﾅﾙ	D&I
- WELCOME TO FIJI ISLANDS AND THE SOUTH PACIFIC	ｵﾘｼﾞﾅﾙ	—
- Fiji Magic, February 1996 THE TOURISM MAGAZINE OF THE FIJI ISLANDS	ｵﾘｼﾞﾅﾙ	—

6．主要面会者リスト

主要面会者リスト

Ministry of Regional Development and Multi-Ethnic Affairs (MRDMEA)

Mr. Luke Ratuvuki	Permanent Secretary
Mr. Poasa Ravea	Deputy Secretary
Mr. Sakenasa Varea	Disaster Manager

Ministry of Agriculture, Fisheries, Forests and ALTA (MAFFA)

Mr. Niumaia Tabunakawai	Deputy Permanent Secretary
Mr. Hari D. Sharma	Director of Drainage and Irrigation (D&I)
Mr. Satya N. Swami	Principal Engineer, Dept. of Drainage and Irrigation (D&I)
Mr. K. M. Cho	Senior Engineer, D&I
Miss Shabnam Yee Yet	Engineer, D&I
Mr. Jone Feresi	Hydrologist, D&I
Mr. Etuate Basaga	Senior Forestry Officer/Licensing, Dept. of Forestry (DOF)
Mr. Sakiusa Tubuna	Senior Economic Planning Officer, Dept. of Economic Planning and Statistics

Ministry of Foreign Affairs

Mr. Emitai L. Boladuadua	Deputy Secretary

Ministry of Finance and Economic Development (MFED)

Mr. Aisake Taito	Senior Planning Officer, Central Planning Office (CPO)
Ms. R. Ram	Senior Planning Officer, CPO

Ministry of Fijian Affairs

Mr. Seva Tabua	Senior Landuse Planner, Native Land Trust Board (NLTB)

Ministry of Public Works, Infrastructure and Transport

Mr. Rishi Raj	Chief Hydrologist, Public Works Dept. (PWD)
Mr. Ashok Kumar	Hydrologist C/E, PWD
Mr. Len Crick	Senior Engineer, PWD

Department of Meteorology

Mr. Rajendra Prasad	Director, Fiji Meteorological Service

Ministry of Land, Mineral Resources, Environment and Energy

Mr. Prem B. Kumar	Principal Geologist, Dept. of Mineral Resources

Fiji Electricity Authority (FEA)

Mr. Amrit Lal	Assistant Public Relations Officer

UNDP (United Nations Development Programme)

Mr. Somsey Norindr	Resident Representative
Mr. Karunesh Bhalla	Deputy Resident Representative

FAO (Food and Agriculture Organization of the United Nations)

Mr. Tang Hon Tat	Project Coordinator, South Pacific Forestry Development Programme (RAS/92/361)

SOPAC (South Pacific Applied Geoscience Commission)

Mr. Alf Simpson	Deputy Director
Mr. Yoshitaka Hosoi	Offshore Geologist, Mineral Economist
Mr. Michel B. Larue	Mapping Geologist

在フィジー日本国大使館

菊池　康典	特命全権大使
東城　康裕	二等書記官

JICA フィジー事務所

木内　志郎	事務所長
神保　孝行	
Mr. Stanley Hancock	Research Associate

7．現地調査経費資料

（1）傭人費

農林水産森林省・灌漑排水局（D&I）提供の資料による。

費　目	年　収（F$）		時　間　給（F$）	
	政府関係	民　間	政府関係	民　間
Principal Engineer	27,165	50,000	—	—
Senior Engineer	19,433	30,000	—	—
Engineer	14,911	20,000	—	—
Technical Officer	11,212	8,000	—	—
Technical Staff	8,660	5,000	—	—
Typist	—	—	2.59	save or lower
Driver	—	—	2.68	save or lower

注）　政府関係の場合、週の勤務時間は44時間を標準とする。

（2）地形図、航空写真購入費

Department of Lands and Surveys提供の資料による。

Scale	Description	Price (F$)
1:750,000	Fiji Islands	3.08
1:250,000	Topographic Map (Viti Levu)	3.30
1:50,000	Topographic Map	4.95
	Aerial Photographs	2.75

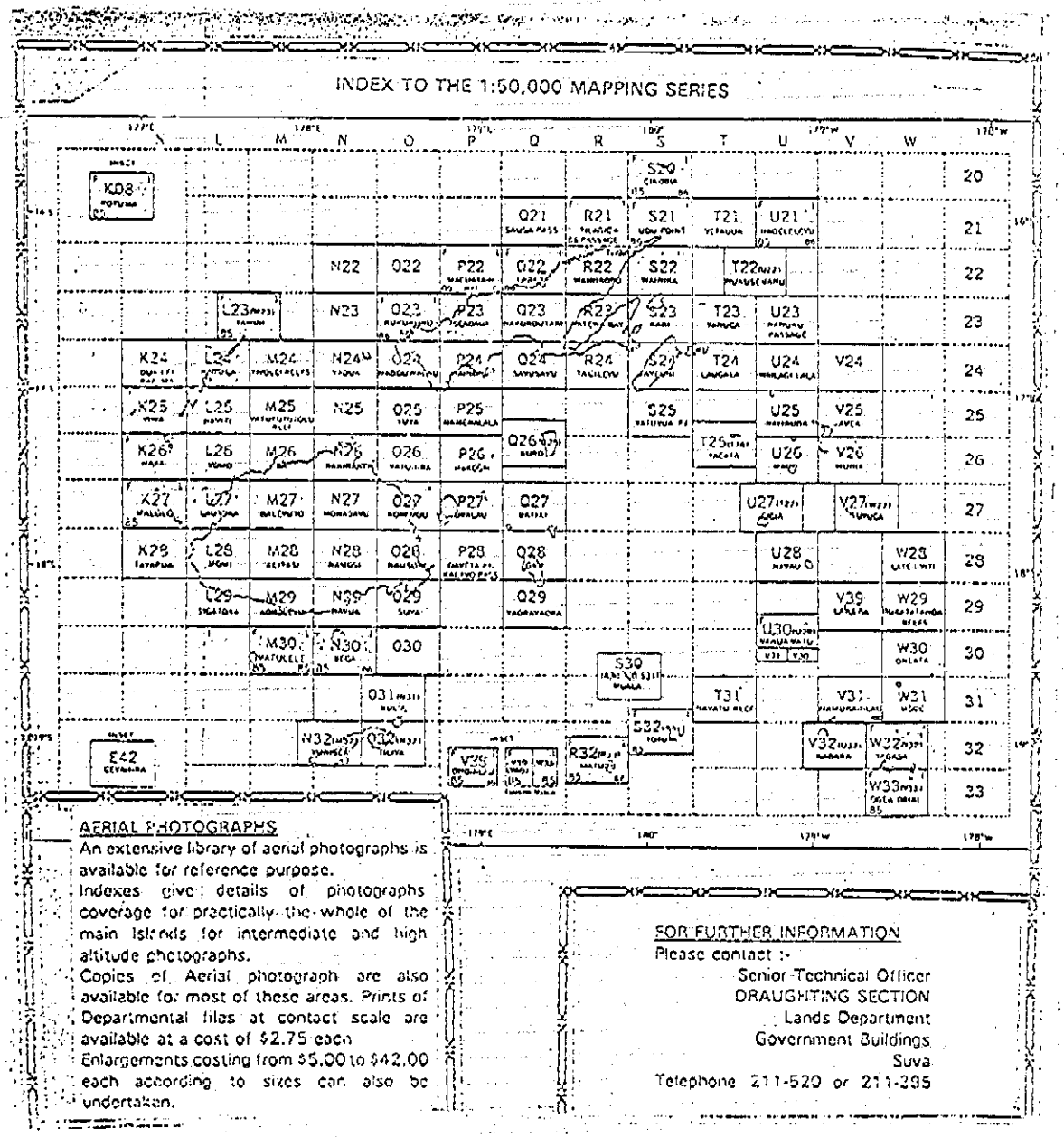
（３）粒度試験費

Fiji Agricultural Chemistry Laboratory 提供の資料による。

Description	Price (F$)
Sample preparation - large sample (coarse & fine grinding)	8.50
Sample preparation - small (coarse grinding only)	6.50
Particle size - fine earth fraction (<2mm)	80.00
Particle size - sieve (>0.063)	40.00

（参考資料）地形図、地質図及び土質試験等に関する今回調査にて収集した価格表

- MAPS, AVAILABLE FROM LANDS AND SURVEYS DEPARTMENT
- MINERAL RESOURCES DEPARTMENT, PUBLICATIONS LIST, PUBLICATIONS OF THE GEOLOGICAL SURVEY
- FIJI AGRICULTURAL CHEMISTRY LABORATORY TEST CHARGES SCHEDULE - 1995



AERIAL PHOTOGRAPHS

An extensive library of aerial photographs is available for reference purpose.

Indexes give details of photographs coverage for practically the whole of the main Islands for intermediate and high altitude photographs.

Copies of Aerial photograph are also available for most of these areas. Prints of Departmental files at contact scale are available at a cost of $2.75 each.

Enlargements costing from $5.00 to $42.00 each according to sizes can also be undertaken.

FOR FURTHER INFORMATION

Please contact :-

Senior Technical Officer
DRAUGHTING SECTION
Lands Department
Government Buildings
Suva
Telephone 211-520 or 211-295

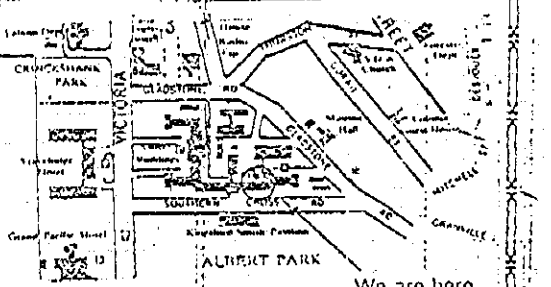
LANDS AND SURVEYS DEPARTMENT
Ministry of Lands Mineral Resources and Energy

MAPS

AVAILABLE FROM

LANDS AND SURVEYS DEPARTMENT

Room No 10 - Government Buildings.
Suva.



MAPS SELLING AGENT

SUVA	• Desai Book Shop
	• Methodist Book Shop
	• Suva Book Shop
LAUTOKA	• Desai Book Shop
NADI	• Sigatoka book Shop
	• Desai Book Shop
P/HABOUR	• Desai Book Shop
RA	• R.C. Bali and Bisun
LABASA	• Desai Book Shop
SIGATOKA	• Sigatoka Book Shop

LIST OF MAPS AVAILABLE FROM LANDS AND SURVEY DIVISION
MINISTRY OF LANDS, MINERAL RESOURCES AND ENERGY
ROOM No 10 RECORDS AND REPROGRAPHIC SUB-SECTION

No	Description	Information	Date	Scale	Size	Price
1	FIJI ISLANDS	ADMINISTRATIVE	1986	1:750000	18"x 28"	$3.08
2	VANUA LEVU (LAND USE)	LAND USE	1984	1:250000	40"x 29"	$6.86
3	VITI LEVU	ADMIN & TOPO	1983	1:250000	36"x 28"	$3.30
4	VANUA LEVU	ADMIN & TOPO	1983	1:250000	36"x 26"	$3.30
5	SUVA, LAMI & ENVIRONS	CIVIC & TOPO	1975	1:15000	28"x 24"	$3.85
6	LAUTOKA STREET MAP	CIVIC	1984	1:10000	22"x 32"	$1.65
7	LABASA STREET MAP	CIVIC	1987	1:10000	29"x 14"	$1.65
8	BEQA (N30)	TOPOGRAPHICAL	1986	1:50000	37"x 26"	$4.95
9	VATULELE (M30)	TOPOGRAPHICAL	1986	1:50000	37"x 26"	$4.95
10	VATOA & TUVARA (V38 (V40), W36)	TOPOGRAPHICAL	1986	1:50000	37"x 26"	$4.95
11	MATUKU (R32, (R33))	TOPOGRAPHICAL	1986	1:50000	37"x 26"	$4.95
12	ONO-I-LAU (V38)	TOPOGRAPHICAL	1986	1:50000	37"x 26"	$4.95
13	CIKOBIA (S20)	TOPOGRAPHICAL	1986	1:50000	37"x 26"	$4.95
14	NAQELELEVU (U21)	TOPOGRAPHICAL	1986	1:50000	37"x 26"	$4.95
15	KOTUMA (K03)	TOPOGRAPHICAL	1987	1:50000	37"x 26"	$4.95
17	YAVARI (L22, (M22))	TOPOGRAPHICAL	1987	1:50000	37"x26"	$4.95
18	MALOLO (K27)	TOPOGRAPHICAL	1987	1:50000	37"x26"	$4.95
19	TOTOYA (S32 (S31))	TOPOGRAPHICAL	1987	1:50000	37"x26"	$4.95
20	SUVA (Q29)	TOPOGRAPHICAL	1989	1:50000	37"x26"	$4.95
21	UDU POINT (S21)	TOPOGRAPHICAL	1988	1:50000	37"x26"	$4.95
22	OGEA (OTUK) (W33 (V33))	TOPOGRAPHICAL	1987	1:50000	37"x26"	$4.95
23	BALEVUTO (M27)	TOPOGRAPHICAL	1990	1:50000	37"x26"	$4.95
24	LABASA (Q22)	TOPOGRAPHICAL	1990	1:50000	37"x26"	$4.95
25	MACUATA-I-WAI (P22)	TOPOGRAPHICAL	1989	1:50000	37"x26"	$4.95
26	TILAGICA PASSAGE (N21)	TOPOGRAPHICAL	1989	1:50000	37"x26"	$4.95
27	RUKURUKU BAY (Q23)	TOPOGRAPHICAL	1989	1:50000	37"x26"	$4.95
28	NAUSORI (Q28)	TOPOGRAPHICAL	1991	1:50000	37"x26"	$4.95
29	RAKIRAKI (N26)	TOPOGRAPHICAL	1992	1:50000	37"x26"	$4.95
30	KEITASI (M29)	TOPOGRAPHICAL	1993	1:50000	37"x26"	$4.95
31	BA (M26)	TOPOGRAPHICAL	1991	1:50000	37"x26	$4.95
32	KOROLEVU (M28)	TOPOGRAPHICAL	1993	1:50000	37"x26"	$4.95
33	VOMO (L26)	TOPOGRAPHICAL	1991	1:50000	37"x26"	$4.95
34	LAUTOKA (L27)	TOPOGRAPHICAL	1991	1:50000	37"x26"	$4.95
35	SIGATOKA (L29)	TOPOGRAPHICAL	1992	1:50000	37"x26"	$4.95
36	SAUSA PASSAGE (Q21)	TOPOGRAPHICAL	1991	1:50000	37"x26"	$4.95
37	VATUIRA (Q26)	TOPOGRAPHICAL	1993	1:50000	37"x26"	$4.95
38	OVALAU (P27)	TOPOGRAPHICAL	1993	1:50000	37"x26"	$4.95
39	KORovou (Q27)	TOPOGRAPHICAL	1993	1:50000	37"x26"	$4.95
40	NAVUA (N29)	TOPOGRAPHICAL	1993	1:50000	37"x26"	$4.95
41	MOMI (L29)	TOPOGRAPHICAL	1992	1:50000	37"x26"	$4.95
42	TAVARUA (K28)	TOPOGRAPHICAL	1990	1:50000	37"x26"	$4.95
43	WAYA (K26)	TOPOGRAPHICAL	1991	1:50000	37"x26"	$4.95
44	VIWA (K26)	TOPOGRAPHICAL	1991	1:50000	37"x26"	$4.95
45	DUA-LEI-RANIMA (K24)	TOPOGRAPHICAL	1991	1:50000	37"x26"	$4.95
46	NACULA (L24)	TOPOGRAPHICAL	1991	1:50000	37"x26"	$4.95
47	WORLD MAP (NZMS 243)	WORLD INFO MAP	1993	1:20000000	34"x48"	$26.00
48	ISLAND TRACINGS	TOPOGRAPHICAL	19	(various)	(various)	$6.60
49	*NLC SHEETS (whole of Fiji islands)	CADASTRAL	19	Various	1 inch = 1"	33"x 27"	$6.60
50	*CCMS SHTS (developed areas only)	CADASTRAL	1993	1:1000	22"x 33"	$ **

NOTE

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- COPIES AVAILABLE - *COMPUTERISED HARD-COPY AT $50.00 PER SHEET AND DYELINE PRINTS AT $5.00 EACH.
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Australia	$1.10	$ 7.15
Canada & USA	$1.10	$11.00
Japan & UK	$1.10	$14.30

Note

- Prices are in Fijian currency
- When ordering give scale of maps.
- A bank draft to the Director of Lands payable through a bank in Fiji must accompany your order
- The bank draft must cover the cost of maps plus postage as listed ~~below~~ above.

MINERAL RESOURCES DEPARTMENT

PUBLICATIONS LIST

PUBLICATIONS OF THE GEOLOGICAL SURVEY

In 1972, the Geological Survey was combined with the Mines Department as the Mineral Resources Division (of the Department of Lands & Mineral Resources), which in 1980 became the Mineral Resources Department. Serial publications of the Geological Survey and of the MRD are numbered separately, and are therefore listed separately below.

Prepayment for publications and postal charges is necessary. All prices are in Fiji currency. Publications can be obtained from

The Librarian,
Mineral Resources Department,
P.M. Bag, Suva, FIJI.

Most maps are printed to accompany Bulletins or other publications (prices given below are for the text plus the relevant maps), but some of these are available separately; all maps are listed separately.

A dash instead of a price indicates that the item is out of print.

Annual Reports (ISSN 0252-2489)

1953	22c	1963	17c	1969	28c
1956	17c	1964 to		1970, 1971	22c each
1959	22c	1966	17c each		
1960	17c	1967, 1968	22c each	Intervening years - out of print	

Bulletins (ISSN 0250-7242)

1	Geology of north Tailevu. R.E. Houtz, 1958.	-
2	Geology of the Lautoka area, north-west Viti Levu. R.W. Bartholomew, 1959.	-
3	Regional geology of Lomawai-Momi, Nandronga, Viti Levu. R.E. Houtz, 1959.	-
4	Geology of the Suva area, Viti Levu. P. Ibbotson, 1960.	-
5	Geology of Savusavu Bay West, Vanua Levu. R.W. Bartholomew, 1959.	-
6	Geology of the Singatoka area, Viti Levu. R.E. Houtz, 1960.	-
9	The geology of Ovalau, Moturiki and Naingani. P. Ibbotson. 1961.	$2.20
10	Regional geology - Keiyasi area. R.E. Houtz, 1963.	-
11	The geology of Mbalevuto area. M.J. Rickard, 1963.	-
12	Geology of east and north-east Viti Levu. J.A. Hirst, 1965.	$19.80
13	Eventually published as MRD Bulletin 3.	
14	The geology of north-eastern Vanua Levu. M.J. Rickard, 1970.	$8.80
15	The geology of southern Viti Levu and Mbengga. R.B. Band, 1968.	$16.50
16	The geology of east-central Vanua Levu. P. Ibbotson, 1969.	$13.20
17	The geology of western Vanua Levu. F.I.E. Coulson, 1971.	$8.80

Economic Report (ISSN 0250-7250)

1	Interim report on the economic geology of Fiji. K.A. Phillips & R.E. Houtz, 1963. [Replaced by MRD Memoir 1]	-

Memoirs (ISSN 0250-7269)

1	Geological studies in southwest Viti Levu. W.J. Skiba, 1964.	$2.20
2	Reconnaissance geology of Vanua Levu. M.J. Rickard, 1966.	$6.60
3	Petrology of the Tertiary caldera, Tavua Goldfield. P. Ibbotson, 1967.	$6.60

Bibliography of the geology of Fiji (ISSN 0252-8398)

Volume 1, compiled by R.F. Duberal & P. Rodda, 1969. [2nd edition in prep.]

Economic Investigations (ISSN 0428-3279)

1 Singatoka iron sands. J.A. Hirst & E.M. Kennedy, 1962.
2 Wainivesi zinc property, Tailevu: diamond drilling 1961-2. P. Rodda, 1963.
3 Vunamoli manganese mine: diamond drilling 1962-63. R.B. Band, 1965.

Occasional Papers

1 Ibbotson, P. 1965. The zonal arrangement of secondary mineral assemblages on the Tavua Goldfield, Fiji. *New Zealand Journal of Geology and Geophysics* 8 (5) : 863-868. $0.55
2 Phillips, K.A. (ed.) 1967. South-west Pacific Geological Survey Conference, Fiji, 1966; proceedings and abstracts. *New Zealand Journal of Geology and Geophysics* 10 (5) : 1175-1296. $10
3 Rodda, P. 1967. Outline of the geology of Viti Levu. *New Zealand Journal of Geology and Geophysics* 10 (5) : 1260-1273. $0.55
4 Rodda, P.; Snelling, N.J.; Rex, D.C. 1967. Radiometric age data on rocks from Viti Levu, Fiji. *New Zealand Journal of Geology and Geophysics* 10 (5) : 1248-1259. $0.55

Miscellaneous

Analyses of rocks from Fiji. P. Rodda (comp.), 1969. $2.20

PUBLICATIONS OF THE MRD

[Mineral Resources Division for 1972-9, Mineral Resources Department from 1980]

Prices in parentheses are for government departments and schools

Annual Reports

Department of Lands & Mineral Resources (ISSN 0252-2470)
1972 - $1.10; 1973 - 94c; 1974 - $1.10.

Mineral Resources Division (ISSN 0252-2462); 1975-1978 - $2.75 (one volume; also published individually as MRD Reports 43 to 46); 1979 - $1.54.

Mineral Resources Department (ISSN 0252-2462)

1980 $1.34	1984 $2.20	1988 $4.11	1992 $
1981 $1.34	1985 $2.20	1989 $4.40	1993 $
1982 $3.03	1986 $2.75	1990 $3.85	
1983 $1.10	1987 $2.10	1991 $	

Hydrogeological Report (ISSN 1011-7512)

1 Groundwater investigation and development in Fiji. D.W. Peach, 1988. $1.43
2 Groundwater in Fiji. I.N. Gale & S.K. Booth, 1993. $13.41
3 Sigatoka Valley Rural Development Scheme: groundwater for irrigation. J. Davies, 1993 $6.70

Reports (ISSN 0250-7234)

See separate list.

Geothermal Reports (ISSN 0250-7277)

1	Preliminary geothermal investigations in the Savusavu area. M.E. Cox, 1980.	$4.95
2	Preliminary geothermal investigations in the Lambasa area. M.E. Cox, 1980.	$4.95
3	The Lambasa geothermal investigation: part I - geophysics. M.E. Cox, 1981.	$4.95
4	The Lambasa geothermal investigation: part II - geochemistry. M.E. Cox, 1980.	$3.85
5	Geothermal investigations in the Savusavu area. M.E. Cox, 1981.	$3.85
6	Heat flow measurements in Fiji. N.J. Skinner, 1983.	$3.85

Technical Records (ISSN 0252-2454)

Volume 1 - photo-ready copy in preparation for printers.

Memoirs (ISSN 0252-2497)

1	Mineral deposits of Fiji (metallic deposits). H. Colley, 1976.	$11.00
2	Vatulele: a study in the geomorphological development of a Fiji island. P.D. Nunn, 1988. ISBN 982-211-006-5.	$1.45
3	The geological and tectonic setting for ground failure hazards in Suva Harbour and environs. G.G. Shorten, 1993.	$8.25

Bibliography of the geology of Fiji (ISSN 0252-8398)

Volume 1 (GS publication) out of stock but second edition in preparation.
Volume 2, compiled by P. Rodda [general works up to 1975]. 1983. $13.25
Volume 3, compiled by D. Greenbaum [open-file mining-company reports on mineral exploration, up to mid 1982]. 1983. $8.80
Volume 4, compiled by P. Rodda [general works up to 1982]. 1994. $4.86
Volume 5, compiled by P. Rodda [general works up to 1987]. 1987. $13.75
Volume 6, compiled by P. Rodda [unpublished general works up to 1991]. 1992. $2.78
Volume 7, compiled by P. Rodda [published general works up to 1991]. 1992. $4.64
Volume 8, compiled by P. Rodda [general works accessed up to 31 December 1992]. 1993. $5.83
Volume 9, compiled by P. Rodda [general works accessed up to 14 June 1994]. In press (1995).
Volume 10, compiled by D. Flint & J.M. Komaibulu [open-file mining-company reports on mineral exploration, up to 1991]. In prep., data available on request.
Volume 11, being compiled by P. Rodda [general works]. Data available on request.

Bulletins (ISSN 0379-1580)

1	The geology of west-central Vanua Levu. W.H. Hindle, 1976.	$13.20
2	Geology of the Lomaiviti and Moala island groups. F.I.E. Coulson, 1976.	$24.20
3	Geology of northern and central Viti Levu. P. Rodda, 1976.	$14.30
4	Geology of southeastern Vanua Levu. P.J. Woodrow, 1976.	$13.20
5	Revised geology of the Lautoka area. B. Rao. Text being edited, map printed.	
6	Geology of Taveuni, Laucala, Qamea, Cikobia and nearby islands. D. Woodhall. Text mostly typeset, map printed.	
7	Geology of Kandavu. P.J. Woodrow, 1980.	$7.70
8	Geology of Rotuma. D. Woodhall, 1987. ISBN 982-211-005-7.	$7.15
9	Geology of the Lau Group. D. Woodhall. Text being edited, maps printed.	
10	Revised geology of the Nadi area. B. Hathway. In preparation.	
11	Geology of the Yasawa and Mamanuca Groups and associated islands. P. Rodda. In prep.	

Economic Investigations (ISSN 0379-296X)

1	The Savundrondro mineral deposit. H. Colley, 1981.	$2.20
2	Raw materials for cement manufacture in Fiji. A. Rahiman, 1983.	$2.20

3 The phosphate deposits and geology of Tuvutha. P. Rodda, 1981. $4.40
4 The Uthiwai Road mineral deposit. H. Colley, 1974. $1.65
5 The Wainivesi marble deposits. S. Niurou. In preparation.

Information Notes (ISSN 1016-2135) All are free

1 Fiji earthquakes. [Anon.] 1986.
2 Fiji groundwater. [Anon.] 1988.
3 Gold in Fiji, by S.T. Niurou & D.J. Flint. 1991.
4 Discovery of gold in Fiji, by S.T. Niurou. 1991.
5 Tsunamis in Fiji, by G. Prasad. 1991.
6 Types of landslides, by I. Dau. 1992.

Geological road logs (annotated strip geological maps, scale 1:100 000, most being available for both directions, printed back to back; logs consisting of text only, though not published, are available for many other roads on Viti Levu and Vanua Levu; all by P. Rodda unless stated otherwise)

Lautoka to Nadi	Nadi to Lautoka
Nadi to Navutu	Navutu to Nadi
Old Queens Road (southwards)	Old Queens Road (northwards)
Navutu to Sigatoka	Sigatoka to Navutu
Votualailai to Sigatoka§	
Sigatoka to Korolevu*	
Korovisilou to Votualailai§	
Korolevu to Yarawa*	Yarawa to Korolevu*
Navua to Korovisilou§	
Yarawa to Navua*	Navua to Yarawa*
Navua to Lami	Lami to Navua
* before reconstruction of early 1980s	§ after reconstruction (logs by B. Rao)
Lautoka to Ba	
Ba to Korovou (Tavua)	Korovou (Tavua) to Ba
Korovou (Tavua) to Rakiraki	Rakiraki to Korovou (Tavua)
Rakiraki to Barotu	
Barotu to Naqia	Naqia to Nanukuloa
Naqia to Korovou (Tailevu)	Korovou (Tailevu) to Naqia
Korovou (Tailevu) to Nausori	Nausori to Korovou (Tailevu)

Occasional Papers

1 Rodda, P. 1976. An occurrence of orbicular gabbro in Fiji. *New Zealand Journal of Geology and Geophysics* 19 (2) : 265-268. $0.55
2 Colley, H.; Rice, C.M. 1978. Kuroko-type deposits in Vanua Levu, Fiji. *New Zealand Journal of Geology and Geophysics* 21 (3) : 277-285. $0.55
3 Colley, H.; Greenbaum, D. 1980. The mineral deposits and metallogenesis of the Fiji Platform. *Economic Geology* 75 (6) : 807-829. $0.83
Cox, M.E. 1978. The Lambasa area geothermal investigation, Fiji. Geothermal Resources Council, Transactions 2 : 121-123. $0.61
Rodda, P. 1984. Stratigraphic names in Fiji - revision of spelling. *New Zealand Journal of Geology and Geophysics* 27 (1) : 97-98. $3.03

Miscellaneous

Introduction to marine geology. S. Kyaw, 1981. Complimentary but restricted.
Lexicon of Fiji stratigraphy. P. Rodda, 1977. Stencilled. Complimentary but restricted.
Fiji as a petroleum prospect. R.A. Eden & R. Smith, 1985. [Includes Bathymetric map of Fiji, scale 1:1 000 000] $2.20

Lomaiviti 1:50 000 geological series [MRD Bulletin 2]

1	Geology of Koro island. F.I.E. Coulson, 1977.	$5.50 F
2	Geology of Makongai and Wakaya. F.I.E. Coulson, 1976.	$5.50 F
3	Geology of Nairai and Mbatiki. F.I.E. Coulson, 1978.	$5.50 F
4	Geology of Ngau island. F.I.E. Coulson, 1976.	$5.50 F

Vanua Levu 1:50 000 geological series
(numbers of the accompanying Bulletins are given)

1	Geology of Ndruandrua area. M.J. Rickard, 1964. [GS 14]	OOS
2	Geology of Undu Peninsula. M.J. Rickard, 1964. [GS 14]	OOS
3	Geology of Rukuruku Bay area. F.I.E. Coulson, 1969. [GS 17]	OOS
4	Geology of Ndreketi area. W.H. Hindle, 1973. [MRD 1]	$5.50 F
5	Geology of Nanduri area. W.H. Hindle, 1974. [MRD 1]	$5.50 F
6	Geology of Lambasa area. P. Ibbotson, 1968. [GS 16]	OOS
7	Geology of Sanggani area. P. Ibbotson, 1968. [GS 16]	OOS
8	Geology of Natewa Bay area. P. Ibbotson, 1968. [GS 16]	OOS
9	Geology of Nambouwalu area. F.I.E. Coulson, 1969. [GS 17]	OOS
10	Geology of Wainunu Bay area. W.H. Hindle, 1973. [MRD 1]	$5.50 F
11	Geology of Savusavu Bay West. R.W. Bartholomew, 1959. [GS 5]	OOS
12	Geology of Savusavu Bay East area. P.J. Woodrow, 1977. [MRD 4]	$5.50 F
13	Geology of Matakunea area. P.J. Woodrow, 1977. [MRD 4]	$5.50 F
14	Geology of Mbutha Bay area. P.J. Woodrow, 1977. [MRD 4]	$5.50 F

15, 16 - see under Miscellaneous (Geology of Taveuni, ...)

Lau Group 1:25 000 geological series [MRD Bulletin 9]

1	Northern Lau. D. Woodhall, 1984. [Excludes Exploring Isles]	$7.15 F
2	Exploring Isles. D. Woodhall, 1984.	$7.15 F
3	Central Lau. D. Woodhall, 1984.	$7.15 F
4	Southern Lau. D. Woodhall, 1985.	$5.50 F

Miscellaneous geological maps

Geological map of north Tailevu. (Scale 1:35 000). R.E. Houtz, 1958? [GS Bulletin 1]	$1.10
The Tertiary caldera, Tavua Goldfield. (Geological map, scale 1:25 000). P. Ibbotson, 1966. [GS Memoir 3]	OOS
Geology of Moala Matuku and Totoya. (Scale 1:50 000). F.I.E. Coulson, 1979. [MRD Bulletin 2]	$5.50 F
Geology of western and central Kandavu. (Scale 1:50 000). P.J. Woodrow, 1979. [MRD Bulletin 7]	$5.50 F
Geology of eastern Kandavu and Astrolabe islands. (Scale 1:50 000). P.J. Woodrow, 1979. [MRD Bulletin 7]	$5.50 F
Geology of Taveuni, Qamea, Laucala, Cikobia and adjacent islands. (Scale 1:50 000). D. Woodhall, 1985. [MRD Bulletin 6]	$5.50 F
Geology of Rotuma. (Scale 1:25 000). D. Woodhall, 1985. [Also shows bathymetry; MRD Bulletin 8]	$5.50 F

Geological road logs - see Publications List

MAP LIST

Most of the maps listed are intended to accompany publications (mentioned in parenthese), but excess copies are usually ordered so that some are available separately. GS refers to Geological Survey; MRD refers to Mineral Resources Division (1972-79) or Mineral Resources Department (1980 onwards). The year given is that of the map itself. Maps are multicoloured unless stated otherwise. The price given is for the map alone, the prices of publications including maps being given in the Publications List (those prices are for text plus maps).

Prepayment of cost and postal charges is necessary before maps or other publications are despatched (except for organisations with which MRD has an exchange agreement). All prices are in Fiji currency.

OOS (out of stock) indicates that the map is no longer available separately; reference to the Publications List will reveal if the relevant publication (with maps) is still available. F after a price indicates that flat (unfolded) copies are available.

Provisional geological map of Fiji. (Scale 1:500 000). K.A. Phillips (comp.), 1965. OOS

Chronostratigraphic map of Fiji. (Scale 1:500 000). P. Rodda (comp.), 1983. [MRD Report 51 accompanying, included in price] $5.50 F

Geology of Viti Levu. (Map, scale 1:250 000). P. Rodda, R.B. Band (comps), 1966. OOS

Reconnaissance geology of Vanua Levu. (Map, scale 1:200 000). M.J. Rickard, 1963. [GS Memoir 2] OOS

Metallogenic map of Viti Levu. (Scale 1:250 000). H. Colley, D. Greenbaum (comps), 1978. [MRD Memoir 1] OOS

Metallogenic map of Vanua Levu. (Scale 1:250 000). H. Colley, D. Greenbaum (comps), 1978. [MRD Memoir 1] $5.50 F

Geochemical map of Vanua Levu; copper. (Scale 1:250 000). H. Colley (comp.), 1976. Black & white; dyeline copy made on request. $2.20 F

Geochemical map of Vanua Levu; zinc. (Scale 1:250 000). H. Colley (comp.), 1976. Black & white; dyeline copy made on request. $2.20 F

Hydrogeological map of Vanua Levu and Taveuni. (Scale 1:250 000). I.N. Gale, 1988. [MRD Hydrogeological Report 2] ISBN 982-211-007-3. $3.30 F

Hydrogeological map of Viti Levu. (Scale 1:250 000). I.N. Gale, 1991. [MRD Hydrogeological Report 2] ISBN 982-211-011-1. $3.30 F

Bathymetric maps

Bathymetric map of Fiji. (Scale 1:1 000 000). R. Smith, T. Raicebe (comps), 1984. [Fiji as a petroleum prospect] $0.55 F

Bathymetric map of Fiji (with shallow seismicity). (Scale 1:1 000 000). I.B. Everingham, R. Smith, T. Raicebe (comps), 1986. OOS

As above but second edition. G. Prasad, I.B. Everingham, R. Smith, T. Raicebe (comps), 1992. $5 F

Bathymetric map of Fiji, Exclusive Economic Zone. (Scale 1:2 500 000). G. Verma, 1987. $2.75 F

1:250 000 Bathymetry Series

Yasawa [Sheet 1]. A. Pratap, T. Raicebe, R. Smith, P. Woodward, 1987. ISBN 982-211-003-0 $4.30 F
Kia [Sheet 2]. A. Pratap, T. Raicebe, R. Smith, P. Woodward, 1987. ISBN 982-211-003-0 $4.40 F
Cikobia [Sheet 3]. A. Pratap, T. Raicebe, R. Smith, D. Woodhall, P. Woodward, 1987. ISBN 982-211-004-9. $4.40 F

1:250 000 Bathymetric Map Series

Viwa [Sheet 4]. A. Pratap, T. Raicebe, R. Smith, P. Woodward, 1992. ISBN 982-211-015-5 $6.82 F

Lomaiviti [Sheet 5]. A. Pratap, T. Raicebe, R. Smith, P. Woodward, 1992. ISBN 982-211-016-2. $6.82 F

Lau [Sheet 69]. A. Pratap, D. Woodhall, T. Raicebe, R. Smith, P. Woodward, 1994. ISBN 982-211-018-9. $7.09 F

Nabukelevu [Sheet 7]. A. Pratap, T. Raicebe, R. Smith, P. Woodward, 1989. ISBN 982-211-008-1. $6.60 F

Matuku [Sheet 8]. A. Pratap, T. Raicebe, R. Smith, P. Woodward, 1989. ISBN 982-211-009-X. $6.60 F

Ono-i-Lau [Sheet 9]. A. Pratap, D. Woodhall, T. Raicebe, R. Smith, P. Woodward, 1991. ISBN 982-211-012-X. $8.80 F

Viti Levu 1:50 000 geological series
(numbers of accompanying Bulletins are given)

1 Geology of the Tavua area. P. Ibbotson, 1961. [GS 8] [Two printings; the second is mainly black and white] OOS

2 Geology of Vaileka area. P. Rodda, 1964. [MRD 3] OOS

3 Geology of Nanukuloa area. J.A. Hirst, 1966. [GS 12] $5.50 F

4 Lautoka. R.W. Bartholomew, 1959. [GS 2] OOS

Revised geology of Lautoka area. B. Rao, 1983. [Includes part of Sheet 10 to the south; MRD 5] $6.05

5 Geology of Mbalevuto area. M.J. Rickard, 1962. [GS 11] OOS

6 Geology of Nandarivatu area. P. Rodda, 1964. [MRD 3] OOS

7 Geology of Wainibuka river area. J.A. Hirst, 1967. [GS 12] $5.50 F

8 Geology of Londoni area. J.A. Hirst, 1967. [GS 12] $5.50 F

9+15 Geology of Lomawai-Momi area. R.E. Houtz, 1959. [Two topographic maps combined; GS 3] OOS

10 Geology of Nandi area. R.W. Bartholomew, 1960. [GS 7] OOS

11 Geology of Keiyasi. R.E. Houtz, 1962. [GS 10] OOS

12 Geology of Namosi area. P. Rodda, 1970. [MRD 3] OOS

13 Geology of Vunindawa area. J.A. Hirst, 1966. [GS 12] $5.50 F

14 Geology of Nanduruloulou area. J.A. Hirst, 1967. [GS 12] $5.50 F

15 See 9

16 Geology of the Singatoka area. R.E. Houtz, 1960. [GS 6] OOS

17 Geology of Korolevu Bay area. R.B. Band, 1967. [GS 15] OOS

18 Geology of Navua River area. R.B. Band, 1967. [GS 15] OOS

19 Geology of Mau area. R.B. Band, 1967. [GS 15] OOS

20 Suva. P. Ibbotson, 1960. [GS 4] $5.50 F

21 Geology of Ovalau, Moturiki & Naigani. P. Ibbotson, 1961. [Black and white; GS 9] OOS

Geology of Ovalau, Moturiki and Naingani. F.I.E. Coulson, 1976. [MRD 2] $5.50 F

22 Geology of Mbengga area. R.B. Band, 1967. [GS 15] OOS

MRD REPORTS

Most of the unpriced Reports now have to be photocopied.

1 Report on the phosphate survey, Tuvuca, 1975. P. Rodda, 1976. 9 pp + 2 figs.

2 Clay deposit near Nadi. A. Rahiman, 1974. 4 pp + 3 figs.

3 Groundwater exploration in the Lautoka region. F.I. Coulson, 1977. 21 pp + 5 figs. Second, revised edition 1993, 18 pp, 5 figs. $1.33.

4 Petrography of samples from the Waikuru Basalt and the Korombalavu Andesite-near Waikuru. P. Rodda, 1977. 7 pp.

5 The Standard Sequence of the Suva Marl below the Purple Marker. P. Rodda, 1979. 22 pp + 1 fig.

6 Geology of the Thuvu Sedimentary Group. P. Rodda, 1977. 17 pp + 4 figs.

7 The history of some mines and prospects of Fiji. R.F. Duberal, P. Rodda, 1978. 23 pp.

8 The status of stratigraphic correlation in Fiji: October 1978. P. Rodda, 1978. 5 pp. Later published by ESCAP: *In* ESCAP 1979. Stratigraphic correlation between sedimentary basins of the ESCAP region, volume VI - Proceedings of the Third Working Group Meeting, 1978. *UN ESCAP, Mineral Resources Development Series* 45. Pages 14-16.

9 Water-quality studies in the Waidina and Rewa Rivers: progress report no. 1. D. Greenbaum, 1979. 14 pp + 13 figs. Second printing 1993, 15 pp, 13 figs. $1.04.

10 Hot springs of Vanua Balavu. P. Rodda, 1979. 4 pp + 1 fig.

11 Vuda Mining Area: history of gold prospecting and mining (1935 to 1975) and implications for further exploration. D. Greenbaum, 1979. 17 pp + 13 figs.

12 A catalogue of non-confidential mineral exploration reports (M.R.D. Exploration Report series). Plus 1st supplement. D. Greenbaum, 1979. 22 pp + 2 figs.

13 Vuda gold prospect: results of surface sampling and diamond drilling by the M.R.D. D. Greenbaum, 1979. 20 pp + 8 figs.

14 Cruise of the R.V. Bulikula to investigate recent volcanic activity in Tonga, July 11-18, 1979. D. Woodhall, 1979. 13 pp + 1 fig, 1 plan. Second printing 1992, 13 pp, 2 figs. 86c.

15 Volcanoes, earthquakes, tsunamis. R.N. Richmond, 1979. 10 pp + 4 figs.

16 Geology of Doi, Ono-i-Lau. P. Rodda, 1980. 6 pp + 2 figs.

17 Glossary of non-Fijian place-names in Fiji. P. Rodda, 1981; 12 pp. Second edition in prep.; xx pp.

18 Case history of mineral development in Fiji: the Namosi copper prospect. R.N. Richmond, 1980. 6 pp + 1 fig.

19 Water-quality studies in the Waidina, Rewa and Navua Rivers. Progress report no. 2. D. Greenbaum, 1981. 14 pp + 15 figs. Second printing 1993, 21 pp, 15 figs. $1.37.

20 A preliminary evaluation of the geology, engineering environment and coral sand resources associated with the fringing and barrier reefs adjacent to Suva. (Incorporates a report on reconnaissance boreholes DDH (E) 80/45, 45A and 45B, 24 to 26 September 1980). R Holmes, 1980. 22 + 11 figs.

21 Sedimentary Basins of the ESCAP region: Fiji. P. Rodda, 1980. 12 pp + 2 figs, 2 plans. Later published by ESCAP: *In* ESCAP 1982. Stratigraphic correlation between sedimentary basins of the ESCAP region, volume VIII -ESCAP atlas of stratigraphy III. *UN ESCAP, Mineral Resources Development Series* 48. Pages 13-21 + two separate sheets with stratigraphic columns.

22 Cruise report: CCOP/SOPAC and M.R.D. R.V. Machias cruise, FJ80-(1) 12th-20th November 1980: a) phosphorites in the southern Lau Group, b) precious coral in the Beqa and Kadavu Passages. V. Baleivanualala, 1980. 7 pp + 2 figs.

23 MRD information systems. P. Rodda, 1981. 10 pp.

24 Separation of sand, silt and clay sizes in marine sediment (quantitative analytical method). S. Kyaw, 1981. 7 pp.

25 Guidelines for the investigation for and development of groundwater sources. D.W. Peach, [1981]. 19 pp, 4 figs.

26 Petrography of samples from the Vatukoro Greywacke in DDH (GTH) 80/46 SOA. P. Rodda, 1981. 3 pp.

27 Status of mineral exploration and mining in Fiji 1980. D. Greenbaum, 1981. 5 pp. Also published anonymously - *Mining Annual Review* 1981 : 416-419.

28 Morphology of typical landslides which occurred Good Friday 1980 in the Serua Hills, Viti Levu, Fiji. R. Howorth, S. Prasad, 1981. 29 pp, 30 figs. $2.20.

29 Notes on DDH (ENG) 77/28 TAMAVUA and the composition of the Lami Limestone. P. Rodda, 1982. 7 pp + 2 figs. $1.10.

30 Fiji: summary of surveys, progress and results in offshore activities -October 1980 to October 1981. H.G. Plummer, R. Holmes, 1982. 8 pp + 1 fig. [Also published anonymously: *In* Eade, J.V. (comp.) 1982. *Committee for Co-ordination of Joint Prospecting for Mineral Resources in South Pacific Offshore Areas (CCOP/SOPAC): Proceedings of the Tenth Session, Port Vila, Vanuatu, 6-14 October 1981.* UN ESCAP, CCOP/SOPAC, Suva. Pages 90-91.]

31 Landslides in the Suva area. O.C. Keefe, 1980. 8 pp +xx.

32 Status of mineral exploration and mining in Fiji 1981. D. Greenbaum, 1982. 5 pp. Also published anonymously - *Mining Annual Review* 1982 : 382-383.

33 Notes on the preparation of geotechnical reports required under the conditions of (Special) Prospecting Licences. D. Greenbaum, 1982. 7 pp.

34

35 Storm surge observations on Gau, Nayau and Tuvuca following Tropical Revolving Storm MELI. R.T.R. Wingfield, 1982. 6 pp + 1 fig. 55c.

36 Calcareous nannoplankton from the Veisari Sandstone, the Lami Limstone, the Suva Marl, and the younger strata at Nakasi. J.A. Wilcoxon, P. Rodda, 1983. 10 text pp + 3 figs. $1.65.

37 Stratospheric dust-veils from explosive-type volcanoes - a neglected global hazard? H.G. Plummer, 19xx. 5 pp. [Presented at xxxxxx

38 Bibliography of the geology of Fiji - supplement to volume 2. Compiled by P. Rodda, 1982. 27 pp. [The volume 2 referred to was still in preparation, with a cut-off date of end 1979; what was eventually published was two volumes, 2 and 4, with cut-off date of volume 4 at end 1982, so that volume 4 includes most of the entries in Report 38.] $1.10.

39 Planktonic foraminifera from the Veisari Sandstone, Naisogo sandstone, Lami Limestone, Suva Marl and Nakasi beds. Compiled by P. Rodda, in press. 22 pp, 3 figs.

40 Reconnaissance geology of Lakeba and Moce. F.I.E. Coulson, 1982. 19 pp + 4 figs. $1.65.

41 The history of petroleum exploration in Fiji. C.S. Robertson, 1982. 13 pp + 1 fig. $1.10.

42 Fiji: summary of surveys, progress and results in offshore activities -October 1981 - October 1982. H.G. Plummer, R.A. Eden, 1982. 20 pp, 5 figs. [A version was later published by CCOP/SOPAC - *in* Eade, J.V. (comp.) 1983. *Committee for Co-ordination of Joint Prospecting for Mineral Resources in South Pacific Offshore Areas (CCOP/SOPAC): Proceedings of the Eleventh Session, Wellington, New Zealand, 9-17 November, 1982.* UN ESCAP, CCOP/SOPAC, Suva. Pages 95-98.] $1.10.

43 The Mineral Resources Division in 1975. Mineral Resources Division, 1982. 35 pp + 5 figs. [Later reproduced as part of: Mineral Resources Department 1984. Annual reports for the years 1975 to 1978. *Parliament of Fiji, Parliamentary Paper 53 of 1984.*] $1.32.

44 The Mineral Resources Division in 1976. Mineral Resources Division, 1982. 35 pp + 5 figs. [See note for Report 43.] $1.32.

45 The Mineral Resources Division in 1977. Mineral Resources Division, 1982. 54 pp, 6 figs. [See note for Report 43.] $1.32.

46 The Mineral Resources Division in 1978. P. Rodda (comp.), 1982. 43 pp, 9 figs. [See note for Report 43.] $1.32.

47 Assessment of the Devodara limestone for a lime pilot plant proposal. J. Lum, 1982. 14 pp, 15 figs. $1.10.

48 Reports of earthquakes felt in Fiji, 1850-1940. I.B. Everingham, 1983. 54 pp + 5 figs. $10.56.

49 Focal mechanism solution for the 16 November 1979 earthquake near Taveuni, Fiji. I.B. Everingham, 1983. 5 pp + 4 figs. $1.10.

50 Petroleum exploration wells drilled in Fiji 1980 to 1982: provisional sections. R.A. Eden, R. Smith, 1983. 15 pp, 6 figs. $1.10.

51 Explanatory notes to accompany the Chronostratigraphic map of Fiji. P. Rodda, 1984. 6 pp, 1 fig. $1.10.

52 Some geological activities of the MRD in 1982. Compiled by P. Rodda, 1983. 36 pp, 6 figs. $1.10.

53 Fiji: summary of surveys, progress and results in offshore activities - October 1982 to October 1983. A. Rahiman, R.A. Eden, 1983. 17 pp + 3 figs. $1.10.

54 Txxxxxxx

55 Shallow earthquakes in the Fiji region - 1982. G. Prasad, 1983. 22 pp, 5 figs. $1.10.

56 Bibliography of the geology of Fiji: first supplement to volume 4. P. Rodda (comp.), 1984. 23 pp. $1.10.

57 The seismicity of the Fiji region - 1983. G. Prasad, 1985. 24 pp, 5 figs. $2.38.

58 Bibliography of the geology of Fiji: first supplement to volume 3 (open-file mining-company reports). J.M. Komaibulu (comp), 1986. 17 pp + 1 fig. 38c.

59 Bibliography of the geology of Fiji: second supplement to volume 4. P. Rodda (comp.), 1984. 23 pp. $2.75.

60 The Fiji Seismograph Network. R. Singh, 1985. 15 pp, 7 figs. $1.10.

61 The seismicity of the Fiji region - 1984. R. Singh, 1987. 30 pp, 8 figs. $1.10.

62 Tsunamis in Fiji. I.B. Everingham, 1987. 19 pp + 7 figs. Second printing (1988), $1.10.

63 Seismic refraction data and crustal structure for southeastern Viti Levu. I.B. Everingham, 1987. 52 pp, 23 figs. Second printing (1988), $1.54 not printed yet

64 Catalogue of felt earthquake reports in Fiji, 1941-1981. I.B. Everingham, 1987. 13 pp + 9 figs. Second printing (1988), $1.10.

65 Geological hazards in Fiji. R. Singh, F. Whippy, 1992. 32 pp, 25 figs. In prep.

66 Hot spring occurrences on Lakeba. D.W. Peach, M. Keshwan, 1987. 11 pp + 10 figs. Second printing (1992), $1.10.

67 Deformation in a back-arc system: the North Fiji Basin (southwest Pacific). Y. Lafoy, 1992. 26 pp, 9 figs. $1.46.

68 Geological setting of the North Fiji Basin: a review. Y. Lafoy, 1992. 60 pp, 7 figs. $3.55.

69 Earthquake catalogue of the southwest Pacific. T. Jones & H. Dropsy.

Major compilations

Hallet, V.; Keshwan, M. 1991. Groundwater investigations in the Yasawa island group. *Fiji Mineral Resources Department Note* BP58/12. 140 pp + 65 figs.

Rodda, P. 1992. Ages of stratigraphic units. *Fiji Mineral Resources Department Note* BP1/99. 26 pp.

Rodda, P. 1992. Islands of Fiji - a geological gazetteer. *Fiji Mineral Resources Department Note* BP1/101. 72 pp.

FIJI AGRICULTURAL CHEMISTRY LABORATORY TEST CHARGES SCHEDULE -1995

SOIL SAMPLES	CHARGE PER SAMPLE
Sample preparation - large sample (coarse & fine grinding) (Note 1.)	$8.50
Sample preparation - small (coarse grinding only) (Note 1.)	$6.50
Moisture factor (Note 2.)	$2.50
pH (in water or KCl)	$3.00
Electrical conductivity (EC)	$3.00
Total carbon	$4.00
Total nitrogen	$4.50
Mineral nitrogen	$5.00
Olsen P	$4.50
Exchangeable bases (total)	$8.00
Exchangeable potassium	$4.00
CEC / base saturation (Note 3.)	$2.50
Exchangeable acidity	$5.00
DTPA-extractable traces (Fe, Cu, Mn, and Zn)	$5.50
DTPA-extractable traces (individual)	$4.50
Extractable boron	$5.00
Phosphorus-extractable sulfate	$4.50
Particle size - fine earth fraction (<2mm)	$80.00
Particle size - sieve (>0.063)	$40.00

PLANT TESTS	
Sample preparation (Note 1.)	$6.00
Nitrogen, phosphorus and potassium	$12.50
Nitrogen	$7.50
Phosphorus	$7.50
Potassium	$5.50
Ca, Mg, Fe, Mn Cu, Zn - individually $4.00 + $1.00 per element	$9.50
Sulfur	$5.50
Boron	$4.50

Note 1. Charged on all samples.

Note 2. Charged on most samples

Note 3. Charged in addition to total exchangeable bases.

20% loading for ten or less samples.

20% discount for greater than 50 samples in one batch.

ANIMAL FEEDS TESTS	CHARGE PER SAMPLE
Sample preparation - (if required) (Note 1.)	$6.00
Sample handling charge (Note 2.)	$1.00
Nitrogen, phosphorus and potassium	$12.50
Nitrogen	$7.50
Phosphorus	$7.50
Ca, Mg, Na, Fe, Mn, Cu, Zn - individually $4.00 + $1.00 per element	
Moisture content	$6.50
Ash	$4.00
Crude fibre	$14.00
Total oxalates in grass	$24.00
Crude fat	$12.50
Acidity (fruits)	$7.00
Total solids (fruits)	$5.50

Note 1. Charged on all samples for N, P,K and metals

Note 2. Charged on all other samples

20% loading for one or two samples.

20% discount for greater than 10 samples in one batch.

FOOD AND OTHER TESTS	
% Moisture in meat	$7.00
% Salt in meat	$8.00
% Fat in meat	$9.00
Nitrite in meat	$9.00
Gold testing	$10.00

Note: 20% loading for less than five samples.

20% discount for greater than 20 samples in one batch.

Prices for other tests on application.

VAT added to total test charge for non zero-rated customers.

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