Philippines-Australia Land Administration and Management Project

LAND PARCEL MAPPING IN PIO2 - ACTIVITY 22

December 2002

REPORT D8

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1 Executive Summary

This report is an integrated report covering the Terms of Reference for the International Land Parcel Mapping and the National Survey and Mapping Advisers.

Also see ***PA-LAMP Cadastral Survey & Mapping Report of June 2002 for Prototype 2 Quezon City Manila****.*

1.1 Objective and Scope of Prototype 2

The objective of this prototype is to produce proven new procedures and demonstrate successful cooperation between land related agencies for the improvement in quality and completeness of land title records. This prototype is not concerned with titling new lots but is concerned with increasing confidence in the existing land registration system.

There are four main types of production activities:

- *CIM and cross indexes to control duplicate land titles and for other administrative purposes;*
- *Validating existing titles held in the ROD;*
- *Reconstitution of current certificates of title which are missing from the Land Register and facilitating the process of providing land owners with new titles as replacement to their missing titles;*
- *Integration of the new records into the ROD, streamlining of land registry operations to maintain quality of land register documents and exchange of land information between related agencies of government.*

In addition, there is a strategic process of developing a national plan for improved management of land ownership related records. This will be based on the lessons learnt from this Prototype, and also from the rural activities in Leyte in the Prototype 1, and will also link with the implementation of the BOO Project.

1.2 Purpose/Task

The overall task in the prototype is to assist in the development, documenting and training on methodologies and processes to create CIM from existing map data in the offices of participating agencies, using survey information and orthophoto maps to control the mapping process. Evaluate and report on the quality and completeness of existing survey data held by various agencies. Include a method to ensure that any land parcel subdivisions/consolidations are captured onto the CIM. The CIM is fundamental to the identification of fake, duplicate and missing titles in the Quezon City pilot area and the processes should be integrated with other prototype processes. In particular, the CIM and associated database records as they are finished are then handed over to the Office and Field Validation steps, within PIO2. The integration of the CIM into the OSS and ROD is a key task in order for the quality of the records to be sustained into the future. The approach will involve feedback from community groups in all stages of the work in addition to PIO2 and other agencies in:

- *procedures;*
- *technology;*

- *organisational arrangements;*
- *staffing and training;*
- *resource sustainability;*
- *quality assurance and management.*

1.3 Pilot Study Location

The Prototype is being implemented in 5 barangays in District 2 of Quezon City.

Barangay	Land Area (ha)	Population
Bagong Silangan	507	35,385
Batasan Hills	576	86,037
Commonwealth	471	129,354
Holy Spirit	329	87,615
Payatas	494	87,253
TOTAL	**2377**	**425,644**

1.4 Recommendations

Considering the way in which this report is written and that it mainly deals with concerns and recommendations for LAM Program, the recommendations need to be read in conjunction with the entire report.

The main recommendations are:

- *Considering the limited capacity of NAMRIA and the failure to adhere to contractual deadlines, it should be considered that for the LAM Program, international tenders be obtained for both the GPS and orthophoto map production;*
- *A system be installed and awareness to the profession in the placement of reference marks, so that future surveys over land that has been surveyed is cheaper to the client and easier for the surveyor to perform;*
- *The way in which the metes and bound are presented in any documentation and survey plans be changed to the international convention, ie 265^{o}35' not N85 35E for modern equipment read 265^{o}35'and N85 35E needs to be calculated. This is a left over from the period early last century where some horizontal circles in the instrument (transits) were by quadrant;*
- *Allocated time given to an International Consultant to review DENR Administrative Order No 98-12 and to rewrite the order into act, regulations and recommended guidelines and practices, prior to the commencement of the LAM Program. This should be done in consultation with the GEP and a parliamentary draftsman so as the wording of the new laws (if redrafted) is succinct;*

- *A specialist consultant be engaged to review the academic sector and recommend changes into the curriculum so that the new graduates have a more in-depth knowledge of modern and relevant survey methodologies, this is vital for the future LAM Program;*
- *A governing body established similar to the various Surveyors Boards' found in the various states in Australia, that has teeth that will ensure that the surveying profession adheres to its code of conduct and its registered surveyors comply with the laws related to cadastral surveys and maintain their competence in all aspects of surveying with rigorous Continued Professional Development and to ostracize those who flaunt the laws and professional conduct;*
- *CIM should not be produced manually if there has not been any formal cadastral project performed in the urban situation. Survey control needs to be available. It is recommended that manual methods are done jointly with the orthophoto maps and survey plans.*
- *Time allocated for a study using a good quality digital camera for the archiving of documents and survey plans instead of scanning. This method was used for the survey plans on the AusAID funded SIISLAP project in the Solomon Islands with great success. This process is cheap and very fast, also it will only require one visit to the agency (except for data that is updated) and a digital image will be available for the encoding of data into the database and its verification;*
- *Suitable and accessible EDM bases, to recognized world standards, should be established within each region.*
- *Tribrach testers should be purchased and installed within each region and should be accessible to the general surveying community.*
- *OSS*
    - *Defining the specific activity structure of OSS integrating mandates that are related to the LAM Program.*
    - *Formulate the activities of participating agencies.*
    - *Placing operating elements in the OSS to supervise execution of functional linkages.*
    - *Issue administrative guidelines defining the function and responsibilities of OSS operations.*
    - *Defining and issue directives to serve as specific guidelines for subordinates of participating agencies to take prompt action and cooperate in the service delivery for clients of the LAM project.*
    - *Developing a continuing in house training component to address competency/skill requirements for inter-agency related activities in LAMP*
    - *Synchronising program policy development of participating agencies:*
        - *Study land related programmes and projects of participating agencies to identify potential integration of activities. The national budget document may be analysed in connection with studies of the implementing land administration projects;*

- *Study specific projects areas of the participating agencies and identify any conflicts and areas of complementation;*

- *Formulate a framework for cooperation in project implementation:*
  - *Study project components and activities to clarify linkages and duplicate services;*
  - *Transfer responsibilities to OSS with participating agency representatives with the OSS providing the key action linkages;*
  - *Issue directives from agency heads for compliance at project operations level.*
- *Formulate financial linkages:*
  - *Interlink financial planning between the agencies where there are dealings through the OSS;*
- *Design and implement HRD programmes for project management and operations administration. Specific linkages with both LGU's and NGO's need to be incorporated:*
  - *Formulate a 5 year HRD plan for both technical and management operations;*
  - *Synchronise the training modules for future requirements in project implementation in both cadastral surveys and land titling.*

2 Cadastral Surveys

The surveying situation in Quezon City is not considered good. All surveys are connected to BLLM in other municipalities by calculation and if these were projected into a computer (the original mother lots have been) it will be noted that there are overlaps and gaps at the common corners.

There is no system of placing permanent reference marks when conducting surveys, the corner monuments are placed but soon disappear when construction of fences or buildings commence. If an identification/relocation survey of any lot is undertaken by a surveyor they must reinstate the entire block to ensure that the identification survey is correct, but then they don't extend across streets to ensure that deed distances are kept. In other words the survey will float. In most other countries the surveyors leave either hidden (below the surface) or visible permanent reference marks to allow the next surveyor to be able to reinstate the original survey relatively easily, thus reducing the cost to the client. In Quezon City the costs will always be high due to the existing survey methodology, past surveys and the lack of survey marks.

The concerns and recommendations for the cadastral component of this report are those mention in the mid term report of June 2002.

2.1 Concerns for Surveying and Survey Records

The state of urban cadastral surveys especially in Quezon City is in disarray and fraught with problems from:

- inadequate survey instruments being used ie old transit theodolites, instruments that are not calibrated etc;
- quality and the capability of survey parties;
- in some cases manipulation of survey results before presenting them to the authorities;
- the lack of permanent reference marks either hidden (underground) or visible;
- dismal records management system which tends to allow valuable records to deteriorate;
- a reference system that ties all surveys by calculation to monuments that inevitable have been destroyed for a long period of time and in most cases are kilometres away from the survey itself;

2.2 The execution of cadastral surveys is designed to achieve the following:

- To provide graphical information ie maps, which containing the land parcels shape and position in respect to other parcels for the adjudication and titling purposes;
- To obtain textual data dealing with landownership, metes and bounds, and information of adjoining landowners;
- To capture other land related information for administration purposes, ie isolated surveys.

2.3 Existing Cadastral Survey Operations

Categories of Cadastral Survey Projects are:

- **Municipal Cadastral Projects** This is a survey project that covers the entire municipality and composed of many barangays. It entails establishing municipal project control, and surveys of the municipality and barangay political boundaries;
- **Barangay Module Project** This project may include one or more barangays to be surveyed, including the political boundaries;
- **Public Land Subdivision Projects** This project may involve a portion or the entire municipality. This happens when funds are allocated; and the execution is that of a normal cadastral project. This is implemented when public lands are settled and the land claimants, as a community, decide to have their claims formally surveyed, so the land adjudication process for titling can proceed;
- **Government Subdivision Survey Project** This project is similar to the Public Land Subdivision Project and undertaken the same way, but usually the area covered is smaller.

2.4 Survey Records

The system of recomputing bearings/azimuths from eg 265^{o} 25’ to N85 25E is prone to typographical and conversion errors and should be abolished and cardinal bearings introduced.

Thought should be given to using a good quality digital camera for the archiving of documents and survey plans instead of scanning. This method was used for the survey plans in the

Solomon Islands on the AusAID funded SIISLAP project with great success. This process is cheap and very fast.

Note if the survey plans are to be used for digitisation then an investigation should proceed to see if there are any differences in scanned and photographed (digital) products.

2.5 International Review of Alternate Survey Options

A study on International alternate survey approaches has been undertaken, see **Annex 1**. This does not purely relate to the PIO2 situation, but it is attached so that the QAP member can see that this has been addressed, for there may always be a possibility that the methodologies may be used in rural residential or urban areas where the lots are large, unlike the situation in Quezon City.

2.6 EDM Bases and Equipment Calibration

The existing EDM base at the University of the Philippines is inadequate for the proper calibration of modern EDM equipment and is not accessible to the broad surveying community across the entire country. Given the capabilities of modern survey equipment there is the need to properly and regularly calibrate EDMs over a 1 kilometre (7 pillar) base and a cyclic error base.

The optical plummet of a tribrach is critical for the centring of instruments, targets and antennae over ground marks. They must be kept in a state of adjustment and should be checked regularly. The best method of checking is with a tribrach tester.

It is recommended that:

- Suitable and accessible EDM bases, to recognized world standards, should be established within each region.
- Tribrach testers should be purchased and installed within each region and should be accessible to the general surveying community.

2.7 Records Management

Development in survey records management has not improved over the last 30 years or more, in fact the production of new records every year has caused greater pressure on records administrators to keep pace in storing, handling and servicing the public with information. Inefficiency, neglect and sometimes irresponsibility has caused the loss, destruction and deterioration of records. It seems that agency managers do not appreciate the importance of a well managed records system. This is reflected by the following conditions:

- Lack of budget to operate records administration;
- Inadequate space for records;
- Poor technically trained personnel in records management units;
- Lack of equipment and materials for records maintenance and reconstruction.

DENR

The inspection of the survey records in both Region 8 and NCR has the following common observations:

- Space used is too small for the volume of records in place, elevated racks and stands to the ceiling are fully stacked, small passageways are sometimes filled with records that are bound or bundled into sacs.

- The methodology of storage especially the survey plans leads to plans being folded, rolled and just pushed into what space is available, this leads to fast deterioration and defacing;
- There is no complete inventory of records;
- Deteriorating records are left to rot;
- Reconstruction of missing and deteriorating records needs to be prioritised;
- Training of records personnel is required;
- The records system lacks budget, equipment, materials, space and personnel;
- Inefficient records servicing is common especially when improperly kept and do not have an inventory;
- Significant volume of records are missing;
- Security copy of NCR records are kept in the same location;
- Filing system of maps and plans leaves much to be desired;
- Most records have no duplicate copies stored in another location, which poses a complete loss in case of fire.

DAR

The DAR survey records are limited compared to DENR. Basically they are mostly copies of surveys of lands covered by CARP, emancipation patents and political boundary surveys by LBM. The survey data is being transformed and projected into a spatial framework bounded by barangay and municipal boundaries to produce municipal and provincial index maps. The spatial data also includes CLOA's, land use information and surveyed lots under voluntary offer to sell and compulsory acquisition.

Note the system is primarily a LIS which can be incorporated into a GIS at a later stage; DAR at the time of interview had no data within the pilot area.

LRA

The records were sighted in LRA, and there is an attempt to have the records section updated, but this is only for records that are alive and then it is more cosmetic than anything else for the records are just put in more durable covers.

Yet where the older documents are archived, they are treated the same as elsewhere and just bundled up and deposited haphazardly where there is room.

It is unacceptable that records that are a countries heritage are treated in this fashion.

3 Cadastral Index Maps (CIM)

The CIM is the an integral part of the approach to improving confidence in land records for it is the spatial component that ties all land records together coherently and avoids overlapping and duplicate titles. The CIM has associated with any given parcel of land within the CIM by the means of a Unique CIM and UPI ie the cross-index key

The unit is still plagued with problems; these are mainly lack of space, equipment and until recently staff. The unit is producing CIM, but not in the way in which was initially intended.

It must be noted that the unit has not produced that many CIM as compared to PIO1, but they have produced the same CIM many times using various methodologies including some block shifts in

the early stages to try and get the CIM on the PRS92 datum. This has now been resolved with the acceptance of the digitised CIM being within plotting accuracy of PRS92.

3.1 Project Area

Barangay	Land Area (ha)	Population
Bagong Silangan	507	35,385
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3.2 CIM Formate

On every available occasion, the CIM formate was presented at workshops and the only problem that has been encountered is the use of the CIM. Once explained that the CIM is only an administrative map of land parcels that ties the parcel to the data in the database. Also is not the intention that the CIM will replace the projection maps held by the various agencies and supply technical information relating to the parcel boundaries; it was accepted. See **Annex 5 CIM Formate**

3.3 Manual Drafting

The hand drawn method has been a dismal failure, and this is not due to the staff, but to the lack of survey control to physically ensure that the CIM is not stretched etc and the methodology that was initially employed when the adviser arrived on the project.

The manual method has not been resurrected mainly due to the control situation. Any CIM produced has been a combination of digital and manual methods. The unit can produce CIM in this manner and it has been quite successful.

The intention was to produce CIM manually by the orthophoto method from June onwards, but NAMRIA was not able to deliver the orthophoto maps on time. This would have solved the majority of the problems that have occurred in PIO2.

3.4 Digital CIM

PIO2 is more advanced than PIO1 only in the fact that they produce digital CIM and PIO1 only produce hand drawn CIM. It can be said that PIO2 can produce CIM, but only by digitisation of the lots and by adding all the other information manually.

The software used for this is AutoCAD, and has been proven to be successful, yet tedious. This is mainly due to only having one operator and one computer which is not suitable for the task.

3.5 GPS Control of Identified Lot Corners

The control for CIM production by GPS was started in the first half of this year,

After some investigations and conformation etc from NAMRIA, the control that was produced for controlling the CIM by connection to existing lot corners has been proven successful. A copy of the results can be found in **Annex 2 Results of GPS Control of Identified Lot Corners.**

From the results it can be said that the digitised lots that used a connection from BLLM1 for the initial positioning of the first mother lot (original estate survey). All other mother lots then used the existing common points as control, and the newer subdivisions controlled by the common points in the mother lots and other subdivisions.

The digitised model was then compared to the GPS coordinates (only in Batasan Hills and Holy Spirit where the GPS trial was conducted). The results show that the average difference is within plotting accuracy and considered better than if done by manual means, therefore the coordinates of the digitised model can be considered as that of PRS92, or close enough for the purposes of CIM production. The unit was advised that all other barangays' can be produced by the digitised method and be considered to be on the PRS92 datum.

3.6 Scanning and Vectorising

The project recently purchased a DesKan express large formate scanner and Provec 3.5, which is software for editing, vectorisation and transformation of the raster data produced by the scanner. This scanner will scan up to A0 but in A4 strips. The scanner head also fits into a separate A4 cradle so that normal A4 scanning can be performed.

The equipment has only one hardware/software key, this makes the full utilisation of the package less than desirable. Either scanning or manipulation of the data can proceed separately, but not at the same instance (the experience of prototype 1, the equipment was supplied and installed in September).

There is a need to investigate other software that is compatible in price to undertake the manipulation of the scanned data; this will amount to a saving of $US1000 per unit if the equipment is recommended to be used in the LAM Program.

At this time the equipment is siting in the packing boxes, it arrived in the first week of December. A training course for the use of the scanning and vectorising will be conducted in the new year (2003) by the suppliers.

3.7 Quality Assurance (QA)

The incorporated of a vigorous QA system has been introduced in the CIM production. At every major point of CIM production QA has been incorporated, these are:

- on completion of the base sheet;
- on the completion of the plotting of lots, cadastral lot numbers and geographical features;
- on the completion of Unique Parcel Identifiers (UPI);
- on the completion of the Preliminary CIM;
- on the completion of the final CIM.

The QA is being applied and the results after some teething problems are commendable.

3.8 Orthophoto Maps

NAMRIA the contracted agency by the project to produce the orthophoto maps have not been able to meet their commitment in the delivery of the orthophoto maps. There is no firm commitment to when these will be completed, hence the International TA will be terminated at the end of 2002 but has been requested to return for one month in 2003 for the training of the staff in the production of CIM utilising orthophoto maps.

NAMRIA have commenced producing orthophoto maps, but it is unknown when the full compliment will be delivered so that the further training and studies can commence.

3.9 CIM Manual

The CIM manual is constantly being updated with updated methodologies of CIM production and minor amendments to clarify certain points of production or additional points that will enable the unit to perform all tasks without TA involvement.

The manual consists of a main manual and attachments which deal with the various methodologies tested and used in CIM production.

The sections are:

- Procedure Manual For Urban and Rural CIM Production by Manual Drafting, this section contains a small section on the production from othophoto maps the index is listed below:

There are intended sections for:

- GIS, ie heads up digitising and the GIS system itself;
- Procedure Manual for Urban and Rural CIM Production by Digitisation.
- Scanning;
- Vectorising;
- Database;
- And any other method to be trialled.

Note the methodologies listed above have not been tested due to either the lack of equipment or software, and the Digitising section is being compiled at the time of writing this report. The database section will be completed at a later stage by the Systems Analyst of PIO2.

3.10 Geographic Information System (GIS)

The development of a GIS as the graphical interface to the land records database will be undertaken in 2003 due to PIO2 not being able to procure the software, ie MapInfo. PA-LAMP has undertaken to purchase the software, but this will not arrive until early to mid December and there will be no time available for the International Adviser to design and implement a GIS into the PIO. The National Land Tenure Statistics Adviser will undertake this task.

3.11 Evaluation of the CIM Unit

An evaluation was conducted on 11 December, and as transcript is attached in **Annex 3**

3.12 Lessons Learned

Annex 4 contains an unedited copy of the transcripts of the lessons learned held in November.

The main points are:

- Survey Plans and Retrieval:
    - The manner in which the plans are stored, *ie there was no logic in the way the survey plans were stored within the CIM Unit, the plans need to be arranged in a way that all relevant plans for a CIM are on hand when the CIM is compiled;*
    - Problems with the agencies holding the plans *there has been constant problems with the actual plan retrieval, records are lost, this could be due to the system of storage. The retrievers in DENR are reluctant to do their allocated tasks, hence actually getting plans takes TIME;*
    - The way in which the plans are stored*, as seen by* ***Section 2.7 Records Management*** *of this report;*
- CIM production by manual method:
    - Non conformity within the CIM and between the CIM, *the staff were not adhering to set procedures as laid down in the manual and the styles when compiling a CIM were different between staff members*;
    - Non adherence to the manual*, the manual in many cases was not followed due to the staff not knowing what was in the manual. There are a number of manuals available within the unit. The main cause is the Filipino does not read manuals*;
    - UPI allocation, *the application of allocating UPI's is a simple task, yet some of the staff are not flexible enough to use common sense, but are more likely to stick clearly to the rules. In other words if one UPI is left out or a number is skipped one does not start form scratch*;
    - Quality Assurance, *the QA was near non existent, or it would be kinder to say that the application of QA and QA techniques was very poor. Therefore stringent QA was implemented*;

  - Lack of adequate equipment to produce the products required, *in the year that the adviser has been in PIO2, very little equipment which is fundamental to the task of drafting was not available, and still isn't*;
  - Management demands for production when they are requiring the staff to attend to other matters, eg attending non CIM workshops etc;

- Digital CIM:
  - The lack of a computer suitable for the requirements, *PIO2 has very few computers and the CIM unit has an extremely old computer with about 50mb of RAM, this is just not suitable for the tasks that the computer is used for, ie digitising*;
  - Lack of licensed software, *there is NO licensed software for any tasks*.

The majority of these problems can be alleviated by just following the manual and using some common sense, this is the reason why stringent QA has been implemented. The cohesion between CIM staff members and the management should be strengthened and the management take more interest in the unit and try and solve the inherent problems so that production can proceed smoothly. The other items that deal with the agencies, equipment and management can only be remedied by management itself.

3.13 Other Sources of Data for Use in CIM Production

The only other source of data identified for the production of CIM is the data held by GIS companies. The main concern in this aspect is how that data was compiled, what is the datum of the data, how was it obtained and used to modify the original data, and most importantly the quality and accuracy.

This data if adopted would have to be rigorously tested including field verification before the project could adopt the data, and then there is the cost, this type of data is usually expensive and may not cover all the areas of interest of the project.

The most efficient way of producing CIM in areas such as Quezon City is undoubtedly orthophoto maps used in conjunction with original survey plans.

4 Unit Costs for Preliminary CIM

4.1 Introduction

This is a first attempt at an approach to estimate unit costs of preparing a Preliminary CIM (ie the cost per CIM). The Preliminary CIM will be validated and field checked before it is considered a final CIM – no final CIM had been prepared at the time of this initial calculation. This estimation is based on an "average CIM" but it should be noted that CIM will vary considerably in the number and size of parcels mapped. Similarly there will be differences in the time required to find copies of Cadastral Survey Maps for initial tracing, and for quality assurance (checking of lot numbers and coordinates etc) of plotted information.

4.2 Methods and Associated Issues

There are two main CIM preparation procedures that have been tested at PIO 2:

Fully manual CIM preparation where parcels are traced from survey plans (after scaling the plans by means of photocopying);

Digitisation of parcel boundaries and manual completion of names and numbers by cartographers.

A further procedure will be implemented when there is sufficient computer equipment available – ie fully digitised CIM preparation.[1] The following unit cost calculation is based on the hybrid digitised/manual procedure that was being practiced at the time of this study.

There are many steps in the preparation of a CIM using this hybrid procedure. The steps can be summarised as follows:

- Retrieval of survey plans (from DENR and LRA);
- Entering bearings and distances of mother lots;
- Digitising parcels within the subdivisions by the calibration method;
- Manual completion of all numbers and names on the CIM;
- 'Office validation' to check against title information held (identifies any later subdivisions);
- 'Field validation'
- Final CIM preparation.

Throughout this process there are some four distinct quality assurance steps and associated corrections to the incomplete and preliminary CIM before final CIM are produced. At the time of the study, no CIM had progressed through all steps. Furthermore, the retrieval of survey plans has been a very difficult and time-consuming process and is still incomplete for many CIM. Not all plans are available from the responsible agencies and remain to be located. As a consequence, the estimation of CIM unit costs described below only considers the steps once survey plans have been retrieved up until preliminary CIM are made available for field validation (steps 2 to 6 inclusive). The costs associated with remaining steps will have to be added at a later date.[2]

4.3 Different Estimates of Time:

4.3.1 Method 1

The 4 cartographers drafting CIM at the time of the calculation were given a target of two CIM per cartographer per week. The remaining 5 persons in the CIM Unit were responsible for management, supervision, digitising, quality assurance and plan retrieval. However, this target has yet to be achieved. The total number of preliminary CIM completed from project commencement up until the time of the study was 72 (this includes 16 large scale CIM 'blowing

[1] At the time of the study there was only one computer and one digitising table and no plotter or large format printer available for CIM production.
[2] Nevertheless, the major costs associated with CIM production are included in the estimate of unit costs provided herein.

up' areas of small parcel size from the normal scale CIM).[3] The target number is therefore not a good basis for unit cost estimates.

4.3.2 Method 2

Cartographers were asked to explain the detailed process and subsequently to estimate the average time to complete the steps. The following assumptions were made in the estimations provided below:

- No time is spent finding/retrieving survey plans;
- CIM are fully filled with parcels (CIM on barangay boundaries, or with large areas where no survey plans are available, will be quicker to complete as a proportion of their area will be blank).[4]

Table 1: Labour time estimates for preliminary CIM preparation

Summary step in the CIM preparation process	Labour time estimates (person-hours) per CIM
Digital steps in producing CIM with parcel boundaries	12
Manual completion of all numbers and names on the CIM plus corrections after QA	20
All QA steps prior to office validation	1
Updating and correction following office validation	N/A

The total labour time for the above steps amounts to 33 hours per CIM.

A form was developed to improve the accuracy of the estimate for the second step in the above table – the most time-consuming. Cartographers will be required to complete this form as they work on new CIM. This is expected to provide a more accurate estimate for labour input.

4.3.2 Method 3

An additional estimation can be simply based on the number of preliminary CIM completed each month using this hybrid procedure and dividing by the total labour time of the 9 person CIM unit. This estimate, unlike the earlier estimates above is the actual output of the CIM unit and includes time taken for other activities that unit personnel undertake (including training and workshop attendance etc). This will result in a comparatively high estimate of the labour input in CIM production.

Table 2: CIM Unit output

Month	June	July	August	September	October	November	**Total**
No. of CIM	8	12	10	21	22	12	**85**

The CIM unit for the past six months was able complete 85 CIM. On an average the CIM personnel composed of nine individuals, completes 1.57 CIM per month. To compute the total labour cost for the 1.57 CIM, the total labour cost of the entire CIM unit including engineers

[3] CIM are produced at 1:1,000 and 'blow-ups' at 1:500.
[4] An average of x parcels was ….

is Php 90599. This is divided by 9 (personnel) and divided by 160 (hrs per month) which is Php 62.92 per hour. This equates to 102 hours to complete one CIM.

Earlier CIM Unit output has been the result of different procedures in CIM production and as such cannot be used to generate unit costs for this hybrid procedure.

4.4 Calculation

The following calculation uses a labour input of x person-hours per preliminary CIM (not including time for plan retrieval, field validation, or final CIM preparation).

The cost of equipment is calculated based on a depreciation rate equivalent to 20% per annum. For the time taken to prepare 1 CIM this is equivalent to x% of the value.

The following draft calculation may be modified if more accurate estimates of resources used in CIM preparation can be determined.

Table 3. Calculation Table

Activity/Resources	Unit	Unit cost (PHP)	Total Quantity	Total Cost (PHP)
Personnel				
Labour Cartography/Digitising/QA [5]	Hours	80.89	102	6417.84
Survey plans[6]				
LRA plan	Plan	9	5	45.00
DENR plan	Plan	5	5	25.00
Blue Print	CIM	9	1	9.00
Travel time and costs to plot or print[7]				
Driver time for return trips[8]	Trip	18.9	11	207.90
Vehicle running costs/depreciation	Trip	60	11	720.00
Drafting materials				
Mylar (22 x 28)	CIM	270	1	270.00
Tracing Paper	CIM	140	1	140.00
Blueprint or whiteprint copies	Copies	9	4	36.00
Drafting equipment (depreciation cost)				
Drafting pen & ink etc	Set	3200	0.0033	10.56
Mechanical pencil	Set	40	0.0033	0.13
Lettering set (Leroy)	Set	9700	0.0033	32.01
Triangular scale	Scale	300	0.0033	0.99
45 deg triangular ruler	Piece	50	0.0033	0.17
30 deg triangular ruler	Piece	50	0.0033	0.17
T square	Piece	80	0.0033	0.26
French curve	Piece	150	0.0033	0.50
Protractor	Piece	80	0.0033	0.26
Cutter	Piece	40	0.0033	0.13
Drawing instrument set	Set	500	0.0033	1.65
Drafting table	Piece	4500	0.0033	14.85
Office chair	Piece	2900	0.0033	9.57
Eraser	Set	120	0.0033	0.40
Lead Pencil	Box	150	0.0033	0.50
Pencil	Box	200	0.0033	0.66
TOTAL				**8014.81**
Unit cost per CIM				**8000**
Unit cost (of CIM preparation) per lot				**53**

Notes:

- Depreciation based on time used per CIM (at equivalent rate of 20% pa) - over 31.4 hours = 0.33% or 0.0033
- Assumes 160 working hours

[5] Average salary for those working on CIM is PHP 10,066 per month. This is equivalent to PHP 80.89 per hour assuming an average of 20 working days per month (allowing for public holidays and fiestas etc) and an 8 hour day.
[6] No allowance has been made for the labour time and trips required to collect plans – this is just the cost of reproduction.
[7] Based on 30 minutes for each return trip to DENR and a driver wage of PHP 6,039 per month (PHP 18.9/hr). Vehicle running and depreciation costs estimated at PHP 10 per km, and each return trip is 6 km.
[8] Based on wage of PHP 6039 per month, 20 working days (8 hours) per month, 30 minutes per trip.

5 Office Accommodation

The office accommodation of PIO2 is dismal to say the least. The office is in a smaller area than the previous location in Quezon City Hall. Since the move there has been more staff employed, more equipment has arrived, ie the plotter and scanner. It is near impossible to move around without physically bumping someone; this is extremely unsatisfactory especially for the draftsmen who can easily have their work ruined by an accidental bump from someone trying to pass through the section.

The office is a non ergonomic environment and extremely unpleasant to work in due to the over crowding and the environment itself. To be able to obtain quality products the office environment should be conducive to the type of work performed within it.

6 Training and Workshops

Workshop	Subject	Attendees
Pantograph Operations (informal)	The use of the pantograph in CIM production.	CIM staff
Lessons Learned	CIM lessons learned	CIM staff
CIM Workshop	Introduction and concessus of the CIM	CIM staff, Manila based Government Agencies and Private Enterprise
GIS/LIS concepts	An understanding of the concepts of GIS and LIS	All prototype staff
Introduction to GIS	Introduction and hands on for basic GIS operation	CIM staff and the Systems Analyst
Plotter	The setup and use of the Cannon Plotter	Selected CIM staff and the Systems Analyst
OSS	Consensus workshop	Key agency and prototype staff
CIM, Field and Office Validation	Workshop on what PIO2's roll in LAMP	Key agency staff and private companies
LAMP Partnership Building	LAMP concepts, PIO1 activities and alternative approaches to land titling practiced in other countries	Regional Geodetic Engineering Profession, Regional DENR Surveys Personnel and selected Private Practitioners

7 One Stop Shop (OSS)

7.1 The OSS Development

The concept of a One Stop Shop is still shrouded in a mirage of high expectations. PIO2 can be optimistic, but most participating agencies are sceptical if not indifferent. There are indications that the other agencies are not fully cooperating.

Developing a working structure for the OSS will be hindered by the various interests of the other agencies, ie by people who have a poor appreciation of the greater impact of LAMP on

national economic welfare and the imminent threat that LAMP holds over the agencies and their staff.

LAMP management has to develop and operationalise, the required authority structure of the OSS. The planning shall carefully develop a logical sequence of shared responsibilities and delegate authority from the participating agencies. Specific authority directives from the central top management relative to specific coordinative actions in the OSS need to be prepared and issued for compliance by the regional and lower level supervisors and operators in the participating agencies.

The present OSS (PIO1) is being hindered by the existing legal framework which directs the actions to be taken while the responsibility still lies with the respective participating agencies, and it is foreseen that the same will happen in PIO2.

7.2 Implications for LAM Program

LAMP is essentially a social, institutional and administrative reform package, designed to break through a maze of entrenched and diffused land administration system. This system is shielded by a complex legal and bureaucratic framework generally manned by people with canalized visions of their respective agency importance and validity. LAMP is facing a formidable wall of indifference to change. Any attempt to break down this wall needs a forging of visionary action directions focused on addressing weaknesses within the system. Realities on the ground have to be confronted and using strategic processes build up acceptance both from the top echelon of management and project level participants. Central to this approach is wielding of a strong political will of the central government decision makers. This is supported by consensus building efforts that are not only informational and educational in nature but rather by confrontational advocacy.

The OSS is the door to transparent interaction between the government and its clients and is a major step in introducing reform, if the system allows it to survive.

7.3 Issues in Developing OSS Operations:

- Defining the specific activity structure of OSS integrating mandates that are related to the LAM Program.
- Formulate the activities of participating agencies.
- Placing operating elements in the OSS to supervise execution of functional linkages.
- Issue administrative guidelines defining the function and responsibilities of OSS operations.
- Defining and issue directives to serve as specific guidelines for subordinates of participating agencies to take prompt action and cooperate in the service delivery for clients of the LAM project.
- Developing a continuing in house training component to address competency/skill requirements for inter-agency related activities in LAMP.

7.4 Activity Steps for OSS Development

While working inside existing legal and institutional frameworks strategic directions have to be explored. Activity focus will have to be formulated with these directions:

- Synchronising program policy development of participating agencies:
    - Study land related programmes and projects of participating agencies to identify potential integration of activities. The national budget document may be analysed in connection with studies of the implementing land administration projects;
    - Study specific projects areas of the participating agencies and identify any conflicts and areas of complementation;
- Formulate a framework for cooperation in project implementation:
    - Study project components and activities to clarify linkages and duplicate services;
    - Transfer responsibilities to OSS with participating agency representatives with the OSS providing the key action linkages;
    - Issue directives from agency heads for compliance at project operations level.
- Formulate financial linkages:
    - Interlink financial planning between the agencies where there are dealings through the OSS;
- Design and implement HRD programmes for project management and operations administration. Specific linkages with both LGU's and NGO's need to be incorporated:
    - Formulate a 5 year HRD plan for both technical and management operations;
    - Synchronise the training modules for future requirements in project implementation in both cadastral surveys and land titling;

7.5 Document Tracking

Document tracking software has been developed (there are some additional features being added for the adaptation in PIO2) the package will be ready for use when the OSS opens. The modifications are being attended to by the PIO2 Systems Analyst.

8 BOO

A three day workshop was held on 22 – 24 July with the BOO project. At the time many things were promised, but since the workshop the adviser has had no contact from BOO. There seems to be huge emerging problems with the BOO project and the adviser believes that this is the main reason that no further communication has occurred.

The concept of BOO is good, except for records quality issues, but the ramifications are the public and government agencies accessing the data will pay heavily for the services.

9 Recommendations

- Considering the limited capacity of NAMRIA and the failure to adhere to contractual deadlines, it should be considered that for the LAM Program, international tenders be obtained for both the GPS and orthophoto map production;
- A system be installed and awareness to the profession in the placement of reference marks, so that future surveys over land that has been surveyed is cheaper to the client and easier for the surveyor to perform;
- The way in which the metes and bound are presented in any documentation and survey plans be changed to the international convention, ie 265°35' not N85 35E for modern equipment read 265°35'and N85 35E needs to be calculated. This is a left over from the period early last century where some horizontal circles in the instrument (transits) were by quadrant;
- Allocated time given to an International Consultant to review DENR Administrative Order No 98-12 and to rewrite the order into act, regulations and recommended guidelines and practices, prior to the commencement of the LAM Program. This should be done in consultation with the GEP and a parliamentary draftsman so as the wording of the new laws (if redrafted) is succinct;
- A specialist consultant be engaged to review the academic sector and recommend changes into the curriculum so that the new graduates have a more in-depth knowledge of modern and relevant survey methodologies, this is vital for the future LAM Program;
- A governing body established similar to the various Surveyors Boards' found in the various states in Australia, that has teeth that will ensure that the surveying profession adheres to its code of conduct and its registered surveyors comply with the laws related to cadastral surveys and maintain their competence in all aspects of surveying with rigorous Continued Professional Development and to ostracize those who flaunt the laws and professional conduct;
- CIM should not be produced manually if there has not been any formal cadastral project performed in the urban situation. Survey control needs to be available. It is recommended that manual methods are done jointly with the orthophoto maps and survey plans.
- Time allocated for a study using a good quality digital camera for the archiving of documents and survey plans instead of scanning. This method was used for the survey plans on the AusAID funded SIISLAP project in the Solomon Islands with great success. This process is cheap and very fast, also it will only require one visit to the agency (except for data that is updated) and a digital image will be available for the encoding of data into the database and its verification;
- Suitable and accessible EDM bases, to recognized world standards, should be established within each region.
- Tribrach testers should be purchased and installed within each region and should be accessible to the general surveying community.
- OSS

- Defining the specific activity structure of OSS integrating mandates that are related to the LAM Program.
- Formulate the activities of participating agencies.
- Placing operating elements in the OSS to supervise execution of functional linkages.
- Issue administrative guidelines defining the function and responsibilities of OSS operations.
- Defining and issue directives to serve as specific guidelines for subordinates of participating agencies to take prompt action and cooperate in the service delivery for clients of the LAM project.
- Developing a continuing in house training component to address competency/skill requirements for inter-agency related activities in LAMP
- Synchronising program policy development of participating agencies:
    - Study land related programmes and projects of participating agencies to identify potential integration of activities. The national budget document may be analysed in connection with studies of the implementing land administration projects;
    - Study specific projects areas of the participating agencies and identify any conflicts and areas of complementation;
- Formulate a framework for cooperation in project implementation:
    - Study project components and activities to clarify linkages and duplicate services;
    - Transfer responsibilities to OSS with participating agency representatives with the OSS providing the key action linkages;
    - Issue directives from agency heads for compliance at project operations level.
- Formulate financial linkages:
    - Interlink financial planning between the agencies where there are dealings through the OSS;
- Design and implement HRD programmes for project management and operations administration. Specific linkages with both LGU's and NGO's need to be incorporated:
    - Formulate a 5 year HRD plan for both technical and management operations;
    - Synchronise the training modules for future requirements in project implementation in both cadastral surveys and land titling.

Annex 1

International View of Alternate Survey Options

1 Introduction

As part of the TOR the advisers were required to investigate what was happening in other countries that have or are implementing reform in land issues. This section of the report will deal with the findings of that study with respect to alternate methods of cadastral surveying to support low cost land titling.

The countries studied were:

- Thailand;
- Laos;
- Indonesia.

Of the three countries only Indonesia has chosen to maintain full survey accuracies in initial land titling. Both Laos and Thailand use the majority of the alternate methods presented in this annex with the exception of digital imagery and digital othophoto maps.

All countries use GPS, but only in certain environments within Indonesia due to the accuracy requirements. GPS is viable in the rural sector of the Philippines especially in open areas and with the addition of traversing where needed and incorporating the other recommended alternate methods listed can easily satisfy the future low accuracy titling requirements, if adopted.

The addition of digital surveys is a methodology that needs to be tested. By using a computer in the field and the orthophoto image the boundaries should be easily identified in open areas and the survey, plan production (ie cadastral and CIM) can be produced at the time of adjudication.

In urban areas it is ***recommended*** that only full surveys are performed especially in major cities where the land prices are extremely high.

The following 3 ***Articles*** were taken from the ***Laos Ministerial Direction on Cadastral Surveying and Cadastral Mapping***.

Article 20 ***Procedure for Re-establishment***

On receipt of an application for the re-establishment of a boundary the chief of the concerned Office of Land shall instruct a surveyor to make a survey of the land parcel which is the subject of the application and gather all the relevant evidence.

All available relevant evidence shall then be collected from the Land Registration System and a survey made of the subject land parcel.

The surveyor shall meet with land use right holders, adjacent land use right holders and village officials to gather further evidence. The surveyor shall assess the evidence using the following order of importance and make a decision.

1. *Recorded agreement between adjacent land use right holders;*
2. *Natural features;*
3. *Monuments;*
4. *Survey markers;*
5. *Occupations;*

6. *Measurements.*

Article 21 ***Inconsistency between Monuments and Measurements***

If a dispute regarding the position of boundary markers and a part of a building, wall, fence or other boundary structure is notified to the chief of the Land Office at the District level or the Office of Land at the Province/Prefecture/Special Zone level the chief shall appoint a responsible person to carry out the following actions:

1. *Collect all information relevant to the concerned land parcels from the Land Registration System.*
2. *Make a survey of the concerned land parcels including the measurement of the external boundaries of the parcel and record the measurements between any boundary marks found.*
3. *By inquiry and use of original information, including the Survey Field Notes and any photomap used in systematic registration if available, determine whether the building, wall, fence or other structure existed at first time registration.*

If the part of a building, wall, fence or other boundary structure is proved to have existed at first time registration then the position of the boundary markers shall be disregarded and a new position for the boundary shall be surveyed.

If the part of a building, wall, fence or other boundary structure is proved to have been constructed after first time registration the responsible person shall attempt to reach an agreement between the concerned land use right land use right holders. If no agreement can be reached the concerned land use right land use right holders shall be advised of their right to have the matter brought before the court.

Where a new position for a boundary is agreed and surveyed no amendment shall be made to the Land Registration System until all affected existing land titles have been presented to the Office of Land at the Province/Prefecture/Special Zone/ level for cancellation.

Article 22 ***Subdivision or Consolidation of Land Parcels with Land Title***

- *Land parcel subdivision is dividing land into new land parcels*
- *Land parcel consolidation is combining two or more land parcels into one new land parcel*
- *An application for subdivision shall be lodged with the chief of the concerned Office of Land in accordance with the regulation on the Land Parcel Registration System.*
- *After an application for subdivision or consolidation has been made in the correct manner, the chief of the Office of Land at the Province/Prefecture/Special Zone level will coordinate with the Land Office at the District concerned and will carry out the following activities:*

1. *Confirm the existing boundaries and boundary markers of the land parcel or land parcels;*
2. *Place boundary markers at the corners of any new land parcel boundaries and remove any unnecessary boundary markers.*
3. *Measure the positions of any new boundary markers;*
4. *Replace any missing boundary markers on the corners of the affected land parcel or parcels;*

5. *Prepare a new Survey Field Notes for each land parcel. Update the Cadastral Map and assign new parcel numbers to all new land parcels.*

From the above articles it can be seen that main factor in boundary definition in Laos is **the agreed position by the parcel owner and adjacent owners** and that:

- The actual surveyed measurements are the least important means of identifying land parcel boundaries;
- The survey plan is the *Survey Field Notes* which is basically the SNS used on this project;
- The *"cadastral survey"* is **only** for the construction of the cadastral map and CIM, and **not the legal identifies of the boundaries**.

This then allows for low accuracy boundary definition and recognises the agreed boundaries over all other methodologies, and this must be the basis of any future rapid and cost efficient land titling within the rural sector in the Philippines.

2 Survey Methods Identified

Survey methods identified for surveys can be:

METHOD	Australia	Thailand (84-03)	Laos (95-03)	Indonesia (94-00)
Traversing:				
• Transit and chain	-	-	-	-
• Theodolite and EDME	x	x	-	x
• Semi Total Station	x	-	-	x
• Total Station	x	x	x	x
• Stadia	-	-	-	-
GPS (including data logger):				
• Point Position	-	-	-	-
• Differential Phase[9]	x	-	-	-
• Differential Code	-	-	-	-
Alternate (requiring dense control)				
• Optical square and chain offset	-	x	x	-
• Chaining by two Distances	-	x	x	-
Orthophoto & Imagery				
• Hard copy, ie Photo/imagery interpretation (office and field)	-	x	x	-
• Digital copy, ie Photo/imagery interpretation (office and field)	x	-	-	-

[9] Differential phase used for the survey control in all projects

2.1 Traversing

There are five identified methods of traversing by the use of an angle measuring instrument and using a distance measuring device, these are discussed in the following table.

METHOD	DISADVANTAGES	ADVANTAGES	RECOMMENDATIONS
Transit and Chain	• Outdated technology; • Cumbersome to use; • Not overly accurate; • Commonly out of alignment; • Survey teams are generally large adding extra cost.	• Commonly found in the Philippines; • Cheap to purchase; • The technical skill of the operators is generally low.	Convince the surveying profession to upgrade the profession to use modern technology that is more accurate and to discourage their use within the project, **NOT RECOMMENDED.**
Stadia	• Inaccurate over long lines; • Outdated technology; • Usually requires either slide rule or tables to reduce results; • Survey teams are generally large adding extra cost; • Cumbersome and time consuming.	• Little equipment required; • The technical skill of the operators is generally low.	Discourage the use within the project due to the method being cumbersome and time consuming. **NOT RECOMMENDED**
Theodolite and EDME	• Outdated technology; • Requires either an attachment to the top of the theodolite or is a separate unit; • Requires more team members due to extra equipment to carry; • Survey teams are generally larger adding extra cost	• More advanced than a transit and chain; • Accuracy is better than a transit and chain; • EDME measures longer distances hence traverse lines can be longer; • Quicker than the last two methods; • Requires periodical servicing and calibration • The technical skill of the operators is usually low.	If calibrated and used correctly is the cheapest form of modern technology. Suggested that the use of this type of equipment be accepted only if the following types are not available.
Semi-Total Station	• Outdated technology; • Manual recording methods; • The technical skill of the operator is more advanced.	• Relatively fast operation; • Measuring device is part of the theodolite; • Less computations to obtain results due to either measuring horizontal distances or working directly in coordinates; • Reasonably priced; • Survey teams are usually small.	This type of equipment is considered better than all those above but does not have the recording capabilities of the total station.
Total Station	• Cost is higher than other types of equipment (note: the cost would be the equivalent to theodolites and semi total stations when first released); • Highly trained personnel; • Requires computers.	• All observations are electronically recorded; • Interface with computer and software for computation of results and graphical presentation; • Extremely accurate if used correctly; • Very fast if used correctly; • Survey teams are usually small.	Preferred option when doing cadastral surveys by traversing. **RECOMMENDED**

2.2 GPS

METHOD	DISADVANTAGES	ADVANTAGES	RECOMMENDATIONS
Point Positioning	• Very low accuracy (5-10m) even with Selective Availability (SA) switched off; • SA could be reactivated at any time; • Need to make a number of observations; • Skill level is higher than traversing methods.	• Quick & efficient; • Low cost of receivers; • Easily used; • Survey teams can consist of one; • All weather capability; • No need for intervisibility between points.	• Not recommended for titling purposes due to the very low accuracy and unreliability of the method.
Differential Code	• Low accuracy (50-100cm); • Less accurate than current survey standards in DENR AO98-12; • Unsuitable under heavy tree cover see **Annex 2** for results; • Data requires post-processing; • Requires skilled field operators; • Requires highly skilled data processors; • Extensive training required.	• Does not require dense or particularly close geodetic control; • Short occupation times; • Relatively quick; • Efficient; • Small team requirement of one or two; • Relatively easy to use; • No need for intervisibility between points • All weather capability; • Processing simpler than for Differential Phase techniques, but still requires training; • Can use medium cost GPS receivers.	• If lower accuracy boundary definition is accepted, it is a possible viable alternative to the use of photomaps and the two low accuracy survey methods, particularly in open areas. (Still subject to results of pilot test to determine the acceptable level of tree cover).
Differential Phase (Relative Positioning)	• Slow in areas with some obstructions, the more obstructions, then the slower the survey; • Not possible in areas with many obstructions – heavy tree cover; • Requires geodetic network to be densified to second order standards at about 5-10 km spacing; • Most methods require post processing; • Requires skilled field operators; • Requires highly skilled personnel for data processing; • Post processing can be difficult & tedious when poor data is recorded; • Extensive training required; • Expensive equipment.	• High accuracy; • Very suitable in open areas where it is quite quick, especially if RTK or Rapid Static is used; • All weather capability; • No need for intervisibility between points; • Small team requirement ie can be done by one or two member team.	• Recommended as an alternative to Total Stations in areas with minimal tree cover, in such areas it would be more efficient, as tree cover increases it becomes less efficient and eventually not possible; • Requires lower density of geodetic control than total station traversing, eg 5-7 km rather than 1-2km for rural areas.

2.3 Orthophoto Maps and Imagery

METHOD	DISADVANTAGES	ADVANTAGES	RECOMMENDATIONS
Overall Imagery and Orthophoto	• Overall high cost, typically $300-400 per sheet (which may cover an average of around 150 rural parcels); • Requires cloud free period to obtain good data; • Procurement time is lengthy; • Requires extensive GPS control, aerotriangulation and DTM for rectification; • Requires interpretation skills; • Not useful in timbered areas for small parcel identification.	• All parcel detail is visible, ie buildings, fences and other occupation that is not obscured by vegetation; • Relatively easy method of survey and CIM production and can be built in the field and or office depending on urban or rural situation; • Requires only one person; • Little training required; • Most efficient for large land areas.	
Hardcopy Imagery	• See overall section; • Satellite imagery resolution not sufficient for urban areas.	• See overall section; • Cadastral surveys and CIM can be built in the field for rural areas	Satellite imagery yet to be tested
Orthophoto	• See overall section	• See overall section; • Surveys and CIM can be built in the field for rural areas; • In urban areas little field verification is required.	Test has only been done on two orthophoto maps that have been procured outside of NAMRIA (note the resolution was not of a good quality). This method has been used successfully in both Thailand and Laos, and would be ideal for both urban and rural areas within the Philippines especially in urban areas where there has not been an official cadastral survey.
Digital Imagery	• See overall section; • Very large image files; • Requires computers; • Requires more highly skilled personnel.	• See overall section; • Surveys and CIM can be built in the field; • GIS/digital model can be easily produced; • Individual lot survey plans can be digitally produced.	Requires testing in rural areas. In use in developed countries for large property identification, ie Australia
Orthophoto	• See overall section; • Very large image files; • Requires computers; • Requires more highly skilled personnel.	• See overall section; • Surveys and CIM can be built in the field; • GIS/digital model can be easily produced; • Individual lot survey plans can be digitally produced.	Requires testing in both urban and rural areas

2.4 Alternate Methods Requiring Dense Control

The methods below require extensive survey control to make them viable. All methods assume that there is a controlled straight line and measurements are made along the line as well as the alternate method described.

METHOD	DISADVANTAGES	ADVANTAGES	RECOMMENDATIONS
Optical square and chain offsets	• Low accuracy; • Manual method.	• Simple; • Quick; • Cheap; • Requires few people; • Skill level low.	• Recommended for use in low accuracy surveys
Two distance connections	• Low accuracy; • Manual method.	• Simple; • Quick; • Requires few people; • Cheap; • Skill level low.	• Recommended for use in low accuracy surveys

2.5 Recommended Alternate Cadastral Methods

The recommended practices for cadastral surveys are:

METHOD	Team	Accuracy	Cost	Survey Control Required	Training / Skill Level
Traversing:					
• Theodolite and EDME	2-4	H	H	M	H
• Semi Total Station	2-4	H	H	M	H
• Total Station	2-4	H	H	M	H
GPS (including data logger):					
• Differential Phase	1-4	H	H	L	H
• Differential Code	1-3	M	M	L	H
Alternate (requiring dense control)					
• Optical square and chain offset	3	M	L	H	L
• Chaining by two Distances	3	M	L	H	L
Orthophoto & Imagery					
• Hard copy, ie Photo/imagery interpretation (office and field)	1-3	L	M	L	L
• Digital copy, ie Photo/imagery interpretation (office and field)	1-3	L	M	L	L

Note: it is recommended that the project supply the survey equipment (ie total stations) and train the operators in their use. In this way it would ensure that the best equipment is used and also technology transfer is achieved, another benefit would be the exposure of the survey profession to

modern technology and hopefully this will give them the motive to move away from the transit and chain.

It must be remembered that there are various circumstances that dictate what methodology will be used when surveying and these are:

- Terrain;
- Vegetation cover;
- Budget for new equipment;
- Education level of staff;
- Value of the land, ie rural which is usually low and urban which is usually high;
- Accuracy requirements.

2.6 The LAMP Partnership Building Seminar and Workshop

The above slides were presented at a works shop in Leyte in November. The main aim was to introduce the GEP and various government agencies that have not attended previous seminars to what LAMP is intending to achieve at this time. All the national counterparts presented what there section was actually doing.

The second day was where the International Advisers presented on the implications of the overseas studies. The presentations started on the legal side, and then followed by what the cadastral surveys could do outside of the present laws, ie surveys by alternate methods. This was followed by the impact that the alternate cadastral methods would have on any control requirements.

A workshop was held in the afternoon after the presentations and the participants were requested to address all the different points that the advisers mentioned in the morning session. Unfortunately this was not done so no feedback is available. Discussions with the LAMP Executive Deputy Director took place after the seminar closed and he mentioned that he didn't expect the participants to broach the subject but it will be done at a later date.

2.7 CIM by Alternate Methods

Alternate CIM methodology was also in the presentation

CIM Method	DISADVANTAGES	ADVANTAGES
Manual (building from survey plans)	• Slow depending on materials available for compilation; • Not feasible without control; • Survey plans are not always at the CIM scale, ie survey plans can vary in the scale for representation of the complete survey and this usually depends on the area the survey covers.	• Low technology; • Minimal training; • Basic Materials and equipment needs.
AutoCAD / Microstation (Digitising)	• Expensive to purchase; • Requires computers; • Requires control of some description; • AutoCAD works on a plane system; • Highly qualified operators.	• Capability of producing the entire CIM within the computer environment; • Can be imported into a GIS; • Easily updated.
Scanning and Vectorising	• Expensive to purchase; • Requires computers; • Vectorising requires skilled operators.	• Produces a digital model; • Can transform existing data onto a new datum; • Added advantage of archiving data.
GPS (Processed Data) (ie using the same electronic data that was used in the construction of the cadastral maps)	• Depending on the equipment cost can be high; • Highly skilled personnel required if using the data in computerised environment; • Requires computers and specialised survey software.	• Can be built digitally; • Relatively quick to produce; • Field data can be digitally manipulated within the software environment and CIM automatically produced.
Total Station (ie using the same electronic data that was used in the construction of the cadastral maps)	• High cost of equipment and traversing; • Requires computers and specialised survey software; • Requires highly trained personnel.	• Can be built digitally; • Field data can be digitally manipulated within the software environment and CIM automatically produced; • Relatively quick and accurate.

CIM Method	DISADVANTAGES	ADVANTAGES
Orthophoto Map (office interpretation)	• High cost of orthophoto map production and associated control; • Not the same scale in urban areas where the parcels are small • Requires light tables; • Photo interpretation skills required.	• Easy to produce, simple technology; • Usually the same scale as the CIM; • On the datum of the project. • The added advantage of seeing what is on the ground; • Low training requirement; • Low chance of significant errors.
MapInfo (Heads Up Digitising)	• Requires a digital image, ie either orthophoto, satellite or scanned survey plans; • Requires computers and software; • Requires highly trained personnel; • Not yet tested.	• Capability of producing the entire CIM within the computer environment; • Seamless map that can be used as the base for a GIS; • Fast, efficient and easily updated; • Direct link to the textual database of land records; • Ideal for front desk of OSS as a GIS; • Not yet tested.
Satellite Imagery	• Not suitable for urban areas • High cost of imagery; • Not yet tested.	• Not yet tested
Others survey methods as depicted in survey methods	• Not a congenial environment for drafting (field)	• Can be done in the field at the same time as the survey; • Simple and efficient.

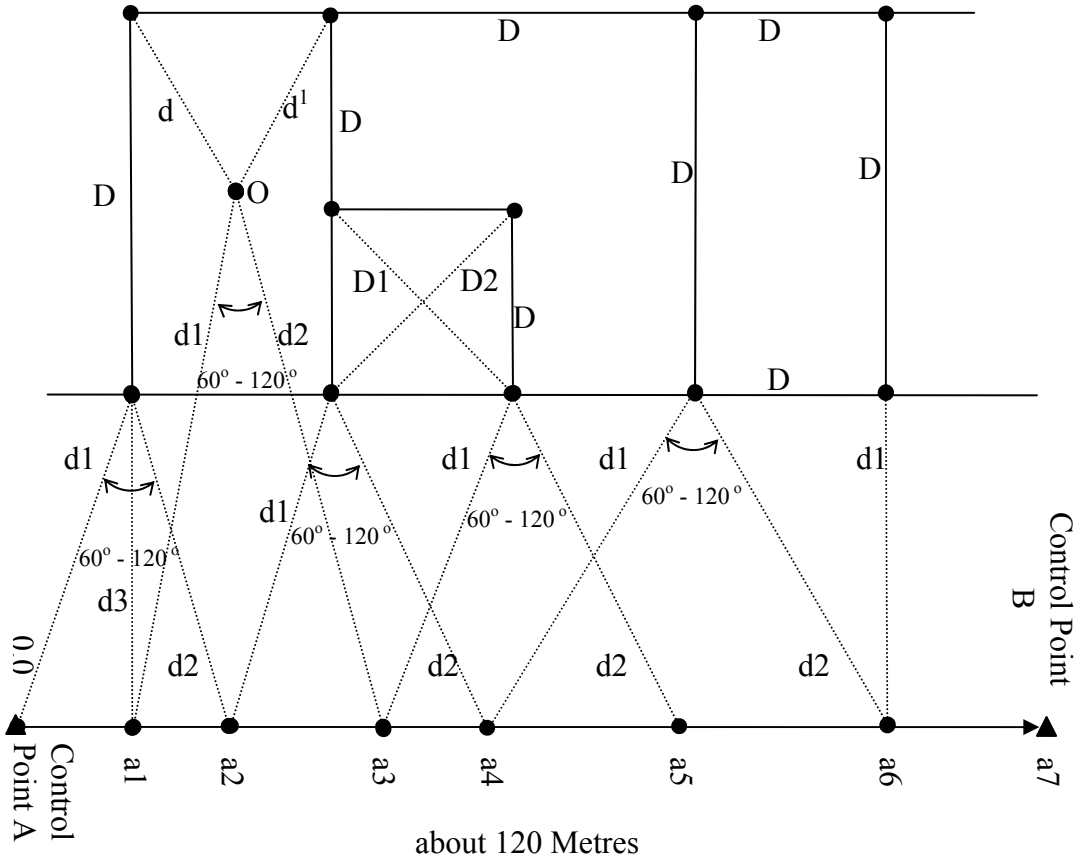
2.8 Examples of Alternate Survey Methods

In both the square offset and two distance methods control is required at each end of the baseline, this can be established by either GPS or Total Station. The baselines should not be longer than about 120 metres.

When observing ie measuring by either method, the running distance will be noted along the line where the distance will be measured from. The measurement to the boundary mark or fence etc on either side of the baseline should have either an "L" or "F" recorded behind the distance to signify which side of the baseline the measurement was taken.

When using the square offset method, an optical square should be used.

The following diagram shows all the alternate measuring methods where no instruments apart from an optical square for square off distances measurement.



WHERE:

A & B are control stations

a1 - a7 are running distances along the base line between the control points

d, d1 & d2 are distances from base line to boundary corner

60^o – 120^o are the offset angles

O is an offset point

d1 & d2 are distances to offset point

D1 & D2 are distances from offset point to boundary corner

D1 and D2 are diagonals of the land parcel

D are measured distances

Annex 2

Results of GPS Control of Identified Lot Corners

GPS CONTROL POINTS FOR BARANGAY HOLY SPIRIT QUEZON CITY VS. CIM COORDINATES								
STATION ID	***PTM Zone 3 GRID COORDINATES***		***CIM COORDINATES***				***Deviation from the Mean***	
	NORTHING	***EASTING***	***NORTHING***	***EASTING***	***ΔN***	***ΔE***	***N***	***E***
102	1624849.18	507438.21	1624851.12	507439.94	-1.9	-1.7	2.3	2.0
101	1624782.46	507420.42	1624785.65	507420.18	-3.2	0.2	3.5	0.0
201	1624856.19	507640.31	1624859.78	507641.83	-3.6	-1.5	3.9	1.8
202	1624961.82	507704.46	1624960.72	507706.66	1.1	-2.2	-0.8	2.4
203	1624920.31	508044.38	1624920.44	508046.78	-0.1	-2.4	0.5	2.6
204	1624731.90	507935.56	1624731.90	507935.55	0.0	0.0	0.3	0.2
301	1624931.85	508176.45	1624931.99	508169.92	-0.1	6.5	0.5	-6.3
501	1624711.24	509081.99	1624714.80	509085.87	-3.6	-3.9	3.9	4.1
601	1624273.68	509026.60	1624274.26	509028.46	-0.6	-1.9	0.9	2.1
701	1624270.46	508829.56	1624267.39	508824.90	3.1	4.7	-2.7	-4.4
702	1624543.47	508831.30	1624543.56	508827.91	-0.1	3.4	0.4	-3.1
801	1624264.89	508474.57	1624264.98	508473.06	-0.1	1.5	0.4	-1.3
802	1624608.72	508425.28	1624610.84	508425.19	-2.1	0.1	2.5	0.2
803	1624333.89	508260.89	1624331.86	508264.30	2.0	-3.4	-1.7	3.7
901	1624538.99	507935.84	1624537.36	507935.38	1.6	0.5	-1.3	-0.2
902	1624268.52	507875.11	1624267.21	507874.45	1.3	0.7	-1.0	-0.4
903	1624544.72	507692.52	1624540.58	507694.17	4.1	-1.7	-3.8	1.9
1001	1624327.02	507441.28	1624325.86	507439.95	1.2	1.3	-0.8	-1.1
1002	1624454.65	507438.90	1624454.23	507439.73	0.4	-0.8	-0.1	1.1
1201	1623966.39	508031.00	1623965.23	508031.92	1.2	-0.9	-0.8	1.2
1202	1623981.76	507888.09	1623981.21	507887.18	0.6	0.9	-0.2	-0.7
1301	1624022.66	508183.29	1624019.21	508179.71	3.4	3.6	-3.1	-3.3
1302	1623785.50	508412.53	1623782.48	508415.75	3.0	-3.2	-2.7	3.5
1401	1624010.85	508941.15	1624011.40	508934.67	-0.5	6.5	0.9	-6.2
1402	1624196.93	508766.86	1624199.77	508765.52	-2.8	1.3	3.2	-1.1
1701	1623390.08	508673.87	1623391.65	508674.10	-1.6	-0.2	1.9	0.5
1702	1623691.66	508823.08	1623693.33	508823.60	-1.7	-0.5	2.0	0.8
1801	1623631.20	508192.55	1623633.32	508188.80	-2.1	3.8	2.4	-3.5
1802	1623542.75	508228.20	1623538.42	508229.98	4.3	-1.8	-4.0	2.0
1803	1623594.88	508377.06	1623595.36	508376.38	-0.5	0.7	0.8	-0.4
1804	1623412.87	508517.28	1623412.34	508516.71	0.5	0.6	-0.2	-0.3
1901	1623505.25	507846.77	1623504.47	507849.55	0.8	-2.8	-0.4	3.0
1902	1623566.87	507797.17	1623561.84	507799.15	5.0	-2.0	-4.7	2.2
2201	1623249.11	508270.91	1623247.00	508268.00	2.1	2.9	-1.8	-2.7
2202	1623246.68	508466.93	1623246.25	508466.63	0.4	0.3	-0.1	0.0
Average					**0.33**	**0.24**		
Difference between PRS92 and Luzon datum					-0.3	-2.2		

The point 1801 has been either misidentified at the observation phase or the station sketch is incorrect. When the GPS point was plotted on the digitised CIM it fell of a different corner, that corners coordinates were used in the table above. The initial difference was -85.5N and 89.3E.

GPS CONTROL POINTS FOR BARANGAY BATASAN HILLS QUEZON CITY VS. CIM COORDINATES								
STATION ID	***PTM Zone 3 GRID COORDINATES***		***CIM COORDINATES***				***Deviation from the Mean***	
	NORTHING	***EASTING***	***NORTHING***	***EASTING***	***ΔN***	***ΔE***	***N***	***E***
09B1	1625034.34	511402.66	1625035.44	511401.83	-1.1	0.8	-0.3	-1.0
09B2	1624955.83	511437.34	1624958.65	511442.61	-2.8	-5.3	1.4	5.1
10B1	1624740.24	510814.71	1624740.42	510814.14	-0.2	0.6	-1.2	-0.7
10B2	1624788.28	511212.17	1624791.45	511211.86	-3.2	0.3	1.8	-0.5
10B3	1624754.80	510795.87	1624754.96	510795.12	-0.2	0.8	-1.2	-0.9
10B4	1625175.25	511178.78	1625171.39	511173.79	3.9	5.0	-5.3	-5.2
10B5	1625047.79	510906.45	1625048.77	510906.89	-1.0	-0.4	-0.4	0.3
10B6	1624961.07	510895.11	1624962.56	510893.81	-1.5	1.3	0.1	-1.5
11B2	1624881.80	510623.74	1624886.49	510628.39	-4.7	-4.6	3.3	4.5
11B4	1625036.37	510546.19	1625035.45	510547.29	0.9	-1.1	-2.3	0.9
11B5	1624809.90	510539.33	1624813.79	510543.18	-3.9	-3.9	2.5	3.7
14B1	1624601.02	510720.16	1624601.77	510720.49	-0.8	-0.3	-0.6	0.2
15B1	1624552.73	511025.97	1624554.79	511025.64	-2.1	0.3	0.7	-0.5
15B2	1624477.27	511175.69	1624476.61	511176.05	0.7	-0.4	-2.0	0.2
15B3	1624556.60	510884.09	1624555.91	510883.52	0.7	0.6	-2.1	-0.7
15B4	1624352.93	511094.23	1624352.20	511096.88	0.7	-2.7	-2.1	2.5
15B5	1624532.17	511053.89	1624532.62	511054.08	-0.4	-0.2	-0.9	0.0
16B1	1624559.87	511498.37	1624560.67	511499.63	-0.8	-1.3	-0.6	1.1
16B2	1624345.73	511642.56	1624345.52	511643.28	0.2	-0.7	-1.6	0.6
17B1	1624450.53	511764.63	1624452.98	511764.96	-2.4	-0.3	1.1	0.2
17B2	1624332.46	511848.55	1624336.05	511847.70	-3.6	0.8	2.2	-1.0
20B1	1624160.08	511820.94	1624165.52	511821.14	-5.4	-0.2	4.0	0.0
20B2	1623941.95	511751.01	1623942.64	511749.67	-0.7	1.3	-0.7	-1.5
21B1	1623977.98	511620.88	1623978.39	511618.43	-0.4	2.4	-1.0	-2.6
21B2	1624177.59	511294.25	1624176.97	511295.76	0.6	-1.5	-2.0	1.4
21B3	1623786.24	511670.17	1623788.35	511669.40	-2.1	0.8	0.7	-0.9
22B1	1623917.52	511069.49	1623917.90	511070.21	-0.4	-0.7	-1.0	0.6
23B1	1623943.44	510496.01	1623947.71	510498.80	-4.3	-2.8	2.9	2.6
24B1	1623989.27	510321.17	1623989.06	510319.70	0.2	1.5	-1.6	-1.6
24B2	1623880.94	509884.29	1623882.40	509891.16	-1.5	-6.9	0.1	6.7
24B3	1623885.81	509920.43	1623890.30	509924.39	-4.5	-4.0	3.1	3.8
25B1	1623826.38	509816.33	1623828.53	509818.63	-2.1	-2.3	0.8	2.1
25B2	1623935.88	509789.49	1623941.91	509789.09	-6.0	0.4	4.6	-0.6
26B1	1623918.52	509345.24	1623921.49	509341.32	-3.0	3.9	1.6	-4.1
26B2	1623823.81	509287.00	1623824.81	509283.28	-1.0	3.7	-0.4	-3.9
26B3	1623785.12	509118.75	1623787.90	509115.97	-2.8	2.8	1.4	-2.9
30B1	1623372.24	509614.05	1623372.24	509614.05	0.0	0.0	-1.4	-0.2
30B2	1623722.56	509725.66	1623722.34	509725.43	0.2	0.2	-1.6	-0.4
30B3	1623666.88	509559.54	1623665.84	509557.06	1.0	2.5	-2.4	-2.6
31B1	1623435.39	509968.30	1623436.79	509968.45	-1.4	-0.2	0.0	0.0
31B2	1623674.33	510185.20	1623678.07	510187.13	-3.7	-1.9	2.4	1.8

GPS CONTROL POINTS FOR BARANGAY BATASAN HILLS QUEZON CITY VS. CIM COORDINATES								
STATION ID	***PTM Zone 3 GRID COORDINATES***		***CIM COORDINATES***				***Deviation from the Mean***	
	NORTHING	***EASTING***	***NORTHING***	***EASTING***	***ΔN***	***ΔE***	***N***	***E***
32B1	1623418.37	510697.82	1623423.30	510700.96	-4.9	-3.1	3.5	3.0
33B2	1623685.14	511059.49	1623686.53	511057.23	-1.4	2.3	0.0	-2.4
33B3	1623378.45	510974.31	1623378.19	510974.55	0.3	-0.2	-1.7	0.1
34B1	1623478.94	511321.84	1623481.13	511320.54	-2.2	1.3	0.8	-1.5
34B2	1623733.44	511336.77	1623735.30	511334.97	-1.9	1.8	0.5	-2.0
40B1	1623210.70	510892.26	1623209.96	510893.25	0.7	-1.0	-2.1	0.8
40B2	1622990.13	510967.46	1622992.57	510967.82	-2.4	-0.4	1.1	0.2
41B1	1623081.30	510597.50	1623078.68	510599.63	2.6	-2.1	-4.0	2.0
41B2	1622944.09	510416.47	1622948.18	510415.20	-4.1	1.3	2.7	-1.4
49B1	1622689.81	510753.87	1622695.13	510750.58	-5.3	3.3	3.9	-3.5
49B2	1622565.94	510475.49	1622561.02	510478.63	4.9	-3.1	-6.3	3.0
49B3	1622845.16	510821.14	1622846.33	510818.17	-1.2	3.0	-0.2	-3.1
Average					**-1.39**	**-0.16**		
Difference between PRS92 and Luzon datum					-0.3	-2.2		

The point 15B3 has been either misidentified at the observation phase or the station sketch is incorrect. When the GPS point was plotted on the digitised CIM it fell of a different corner, that corners coordinates were used in the table above. The initial difference was -17.4N and -7.2E.

Annex 3

Evaluation of the CIM Unit

Evaluation Table

Activity/Sub-Activity/ or Key Step	Strengths	Weaknesses	Constraints	Recommendations/Lessons
1. Retrieval of Survey Plans	The paying of bills on survey plans for LRA to fast track the retrieving	• Only one retriever from DENR-NCR retrieves plans for PIO2	• Survey plans from DENR are not retrieved.	• Attention on the retrieval should have been done prior to CIM preparation • Creation of a database structure • To prepare the list of survey plans that needs to be retrieve promptly. • A revolving fund is needed to make the retrieval efficient. • Access to LARES records is needed to fast-track the retrieval
2. Encoding of Plans	Existence of a database	• The absence of link between the database of Office Validation and CIM • Unable to detect LRA/DENR plans	• Unclear entries	• A link between the database of OV and CIM is needed. • Projection maps can be used for the creation of CIM • A computer dedicated to the CIM database is needed.
3.Sheet preparation/parcel	• Digitized CIM: venue for	• Wrong calibration at times	• CIM are not produced	• Digitized CIM are more accurate and delivers

Activity/Sub-Activity/ or Key Step	Strengths	Weaknesses	Constraints	Recommendations/Lessons
drafting	committing erasures are limited • Availability of plotter and CIM manual	• Delay in the CIM production	correctly due to the lack of technical descriptions • Low memory of the computer. • Lack of manpower	prompt results. • QA is essential for achieving quality output • Capacity building for the CIM unit is needed **prior** to the development of CIM

Activity/Sub-Activity/ or Key Step	Strengths	Weaknesses	Constraints	Recommendations/Lessons
4. QA	• The presence of a standard form of doing QA • Familiarity with the survey plans • Development of a color coding scheme in the correction of CIM	• The lack of survey plans (missing or lost) • Lack of storage facility • Filling out of the QA forms	• No survey plans to counter check the CIM developed • The QA person cannot finish their required targets in time	• To have a group an individual from the CIM unit to focus on research of missing survey plans • There should be a provision for a storage facility • To test the streamlining of the QA monitoring sheet to aid in expediting the QA process • Increase the number of people to do QA • Individuals that should be hired to do the QA should be familiar in with the survey plans to facilitate the counter checking of survey plans with CIM

Annex 4

CIM Lessons Learned

I. Retrieval of records (Survey Plans)

- *Lessons*
  - *Arrange the survey plans numerically increasing as long as the database is updated and linked to a "parent-child" manner.*
  - *In the agencies with missing records, acquire records from different resources like private practitioners/developers, barangay officials.*
  - *It is useful to have a focal person from each of the agencies.*
  - *The focal person [PIO2] always updates the status of retrieval to the CIM chief as the CIM chief to the PIO2 manager.*
  - *The follow thru should not end from the CIM level, it is important that the management must act on it immediately.*
  - *A meeting was set on one of the DENR-NCR officials stating the problem on the retrieval and he had committed two of their retrievers.*
  - *The focal person will update the database immediately as records are retrieved.*
  - *The records keeper is the one responsible in filing the records systematically as soon as he/she received it [survey plans] from the focal person*
  - *It is very important to keep a good inventory of the existing survey plans.*
  - *Inculcate in the minds of the CIM unit to be consciously responsible and perform endless effort to return all records to its proper position.*
  - *Provide a retrieving schedule prior to CIM compilation.*
- *Issues Arising*
  - *The DENR-NCR retrievers are always on-leave and are not committed in full-time retrieval.*
  - *No available cabinet for proper filing of records.*
- *For Action*
  - *Prepare letter to DENR officials stating the current status in the retrieval that the project is not getting full support from the agencies as oppose to what is stated in the MOA.*
  - *Update the survey plan database to include a link on the parent-child structure.*
  - *Add fields in the database that indicates the parent and the CIM number.*
  - *Arrange meeting for the TA (Mapping) and the Information and System Analyst III.*

II. CIM Preparation

- *Lessons*
  - *Grid lines – the latitude, longitude, ticks are manually plotted*
  - *The lower box in the CIM information must include the ff:*
    - *Road lots*
    - *Brgy boundary*
    - *Brgy name, CIM number*
  - *Some information were not reflected in the CIM, lacks QA*
  - *The cartographer should learn to impose proper work in the CIM before passing the CIM to the QA person to minimize the redundant flow of CIM.*

- *Difficulty in assigning UPI in the 'z' form. The blocks are not oriented in the same direction.*
- *The QA guideline was not properly followed as a result, the CIM Control Register was not utilized. In the QA sheets, it is important to include comments, date and signature of the QA personnel. Remember to tick every step on each of the QA sheets.*
- *The cartographers should be expected to have basic cartographic skills and no need for 'basic' trainings.*
- *No pencil in UPI because it is time consuming.*
- *The CIM sheets will not join if prepared in two different methods.*
- *In the preparation of the final CIM, use the digitized method since it has already been investigated thru GPS and the results are acceptable. The digitized copies are close enough to PRS92 by 2 meters.*
- *Limit the number of trainings and workshop participation to be able to focus on the operational tasks of each CIM staff.*
- *Transfer all the information from the Hand-drawn CIM to Digitized CIM.*
- *Always read the CIM manual.*
- *UPI will not be renumbered instead it will be numbered next to the highest UPI number.*
- *All number information should be read upright (UPI and Lot number)*
- *If the drawing is wrong, don't try erasing all, just keep them [cartographers] informed of their mistakes and just apply it when in Final CIM.*
- *For road lots : UPI RD# RDName*
- *River name should be in Italics.*
- *Always stick with QUALITY over quantity.*
- *Block name should be in the upper portion of the parcels (single line)*
- *It has been suggested by the TA to include Tivoli.*
- *The QA form should contain comments and not on the mind*
- *The QA did not apply the proper QA procedure*
- *The comments are important for everybody's access*
- *All of the QA will be applied on the final CIM and all of the drafting standards will be applied*
- *Develop a Network database (survey plans) between the OV database.*
- *The responsibility of the retriever to see if the plans are correct and update it in the database.*
- *Upon retrieving the survey plan from the file, and log into the records*
- *The linking of the databases of OV and SP should have been done to do query in the assessor's database.*
- *Never rely on OV to check CIM work*
- *Always stick with QUALITY work*

➢ *Issues Arising*

- *The CIM unit is dire in need of computer to the updating of the CIM Control Register and the Survey Plan database*

- *The focal person has also identified the importance of his workstation to give security in the database.*
- *The CIM unit has the following administrative problems:*
- *Lack of Computer*
- *No Map Cabinets*
- *No Software*
- *No Drafting tables*
- *Not enough Office space*
- *No proper lighting*
- *Requested for 6 cartographers and only 4 were approved*
- *The management is demanding an output knowing that the PIO2 staff (primarily the CIM staff) is actively busy preparing and attending work programs*
- *The computer of the CIM is old and not of top quality. These results to delay in the production and inefficiency due to the hassle of always restarting the computer.*

- *For action*
  - *Remind management to remind the partner agencies of their commitment from the MOA signed that the PIO2 is not getting full cooperation and support from other agencies.*
  - *Remind management to remind the DENR officials regarding the level of commitment of the DENR retrievers are giving to PIO2.*
  - *Discuss with the System Analysts III to redesign the survey plan database and to include extra field that includes the link of the mother survey plan number to its children and its CIM number*
  - *All survey plans can be arranged in an increasing order as long as the database should be updated in a "parent-child" structure*
  - *Ensure that the CIM Control Register is utilized*
  - *Prepare letter justification explaining the need of computer*
  - *Classify and identify the standard CL sizes to be used*
  - *Follow-up Admin matters*
  - *Transfer UPI in digital format and separate it as another layer*
  - *Explore/Discuss with the Supply Officer possibilities for upgrading the computer unit of CIM*
- *Recommendation*
  - *Long term suggests that there should be at most 2 months course before the actual work.*

Annex 5

CIM Formate

1.1 Cadastral Index Maps (CIM)

- The CIM is a map series that covers all cadastral related information. The CIM shows the cadastral information as spatial (graphical) index only, ie a working map. The CIM is not a legal identifier of land and does not replace the land records such as Certificate of Title and survey plans. It is used to manage and control the lands records process by providing a means of identifying individual land parcels and the associated land records ie titles and survey plans etc.

1.2 CIM Scale and Numbering

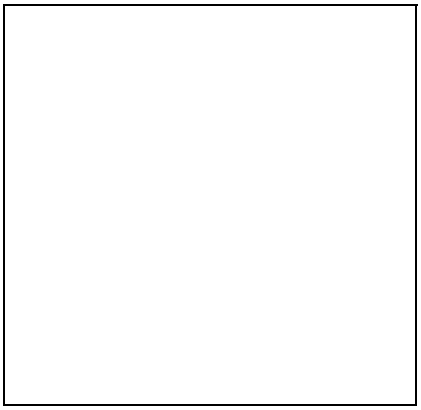
All CIM will have a unique number, in this manner a CIM location and scale can be identified by the CIM number.

The base cadastral map within the Philippines is 1:4000 and depending on the location, ie Rural or Urban, the scale can be either one of the following:

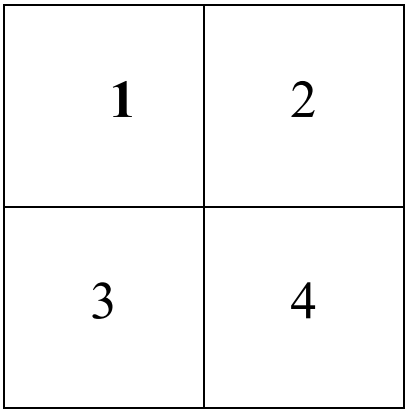
- 1:4000;
- 1:2000;
- 1:1000;
- 1:500.

Basically the CIM will be numbered by the geographical coordinates of the bottom left corner of the base 1:4000 map sheet and then broken down into 1:2000, 1:1000 and 1:500 sheet numbers.

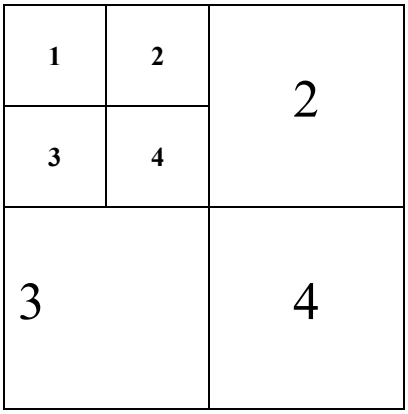
Below is a schematic drawing of a standard 1:4000



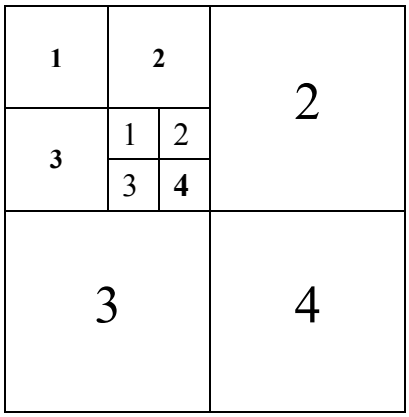
This can be broken down into 4 by 1:2000 map sheets



This can be broken down into 4 by 1:1000 map sheets



This can be broken down into 4 by 1:500 map sheets



14°30'

121°15'

The bottom left corner of the 1:4000 map sheet is defined by Latitude eg $14^{o}30'$ and Longitude of $121^{o}15'$.

The CIM numbering can now be the degrees and minutes of that sheet corner. Considering that the Philippines longitude extends for only 5^{o} the digit for 100 degrees longitude can be eliminated, leaving 4 significant numbers that can define the corner of the 1:4000 CIM, ie 14302115.

To enable the 1:2000 sheet numbering ie sheet 1 in this case an extra digit is required, 143021151 indicates this sheet. To enable the 1:1000 map sheet to be shown and extra digit is added ie 1430211514. To enable the 1:500 map sheet to be shown an extra digit is shown ie 14302115144.

Using the example shown above, if only the 1:4000 sheet is referred to then the CIM number would be 14302115000, if the 1:2000 sheet is referred to the CIM number would be 14302115100. If the 1:1000 sheet were referred to the CIM number would be 14302115140. If the 1:500 sheet were referred to the CIM number would be 14302115144.

This then becomes a unique CIM numbering system and by this number any sheet can be located geographically with ease.

Each CIM will be a specified size, ie the area shown within the CIM will depend on the scale of the CIM, being:

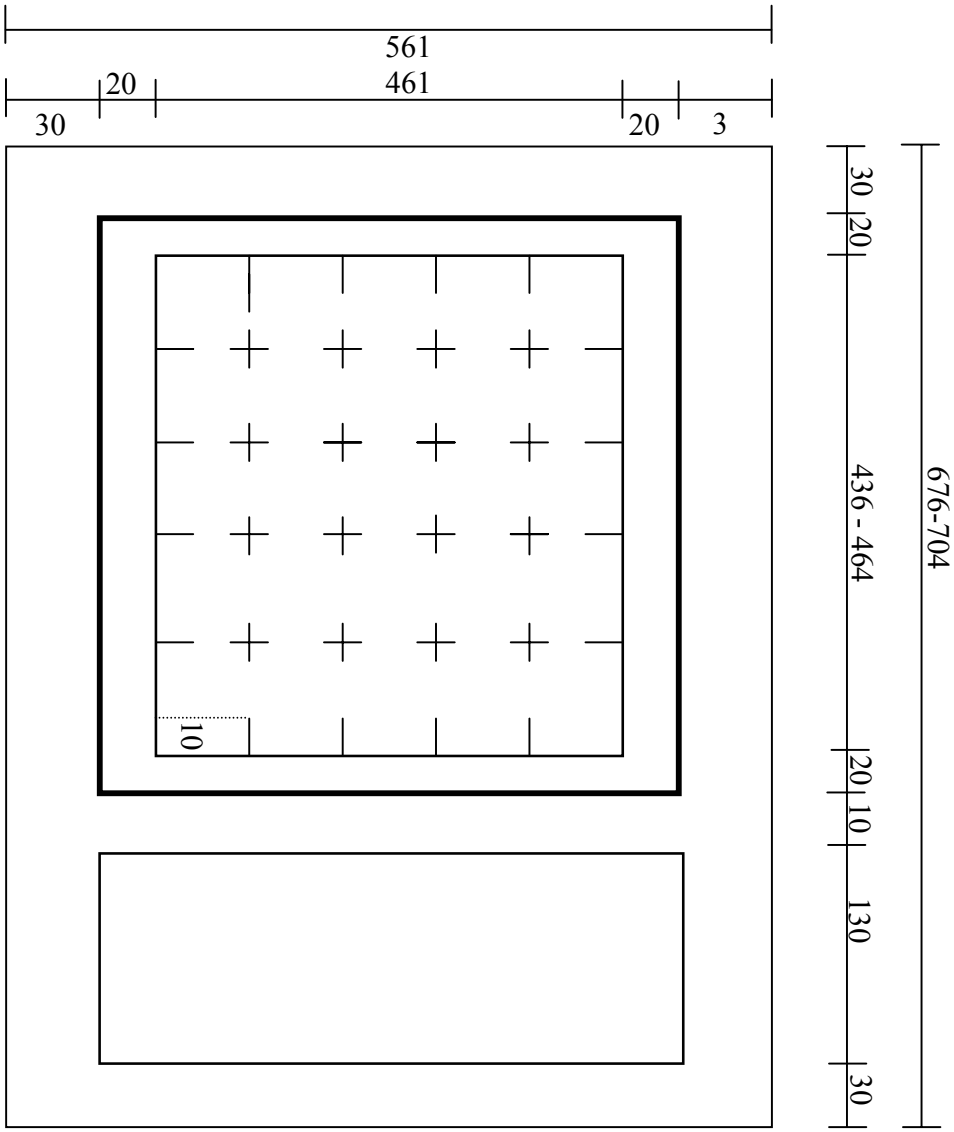
- 1:4000, the map sheet will be 1' (one minute) of arc of latitude and longitude.
- 1:2000, the map sheet will be 30" (thirty seconds) of arc of latitude and longitude.
- 1:1000, the map sheet will be 15" (fifteen seconds) of arc of latitude and longitude.
- 1:500, the map sheet will be 7.5" (seven and a half seconds) of arc of latitude and longitude.

1.3 CIM Parcel (Lot) Numbering

Every parcel of land with or without a title will be shown on the CIM and given a Unique Parcel Identifier (UPI) ie a unique number that is not repeated within the CIM where that parcel occurs. A Cross Index Database (CrossIndex) will maintain an up to date reference of each parcel of land on any CIM, with respect to all the relevant information held by other participating agencies dealing with that parcel.

Dimensions of Cadastral Index Map Sheet

Dimensions are in millimetres



Annex 6

Adviser Terms of Reference

TERMS OF REFERENCE

INTERNATIONAL LAND PARCEL MAPPING ADVISER

Second Part of Long Term Assignment (2001/2002)

The PA-LAMP foreshadows a potential 15-20 year program to improve land administration in the Philippines. It is a strategic GOP initiative which aims to support an efficient land market and alleviate the present low level of confidence in the system of formal land registration and the lack of tenure security.

The **Goal** of AusAID assistance, through support of the TA program, is *to assist the GOP to improve the effectiveness, transparency and efficiency of land administration to achieve the resultant flow of economic and social benefits in the Philippines.*

The **Purpose** of the TA program is *to assist the GOP to establish structures and operating procedures for a long term program to reform the land administration system in the Philippines.*

The Land Parcel Mapping adviser to the LAMP Project will work at both Prototype 1 (Leyte) and 2 (Quezon City). The exact timings will be determined month by month depending on the work needs. It is expected that slightly more time will be spent at prototype 2.

The adviser will report to the TA team leader. The Land Parcel mapping adviser will work closely with Project counterparts at each Project site.

The approach at all times will provide the Project with best practice, a safe working situation and be Gender sensitive. The adviser will cooperate with the members of the Quality Assurance Panel whose job it is to verify that TA outputs are of a suitable standard and completeness. To this end, the adviser shall maintain an up to date work plan and have regular review meetings with counterparts on progress, issues and changes to the plan. A monthly report will be submitted to the team leader.

This TOR addresses the second 6 months of the assignment. Since the photomaps to be supplied by NAMRIA are late the third assignment (in 2003) will be delayed start until such photomaps are available.

The International land parcel mapping adviser will be responsible for completing the following work no later than 31 December 2002 (reference is the PDD and the work to be completed is described as Deliverables 21 and 22 in the AusAid – AMC contract):

1. The task in prototype 1 is to assist in the identification of options for improved survey and mapping methods to produce land parcel descriptions that are appropriate to support land titling. In particular, methods for producing the initial CIM based on existing records, updating the CIM from new surveys, producing cadastral maps from new surveys, and parcel descriptions on survey plans and other survey documents. The options considered may not necessarily be strictly

available under the existing laws in the country but need to be studied so that the planned activity to prepare a new land administration code may have guidance on the type of methods that the new legal framework should accommodate and the flexibility needed for efficient and timely mass land titling. The options will be described in terms of activities, resources, unit costs, staff skill levels required, organisation arrangements and operational convenience, these descriptions having been obtained from overseas experience. The advantages and disadvantages of each option shall be listed and a preliminary evaluation concluded, as it might apply to the Philippines. A range of stakeholders are to be involved in the evaluation, including the LMB and the private sector. Provide report on findings and recommendations.

2. The task in prototype 2 is to assist in the identification of options for better operations of mapping, and the testing and evaluation of options against agreed criteria. To include potential changes to the map product design (mapping system adopted etc), sources of base data, linkage to the textual database, update of the maps, security of the maps. The options should not be limited by existing regulations and laws, which may restrict current practices as these, could be changed for future operations. The evaluation should draw on experience in the project and overseas experience. A range of stakeholders are to be involved in the evaluation, including the LMB and the private sector. Provide report on findings and recommendations.

3. The CIM are to be fundamental to the identification of fake, duplicate and missing titles in the Quezon City pilot area and the processes should be integrated with other prototype processes. The integration of the CIM into the OSS and the ROD is a key task in order for the quality of the records to be sustained into the future. The approach will involve community groups in all stages of the work in addition to the PIO2 agencies.

4. A pilot test of a GIS (geographic information system) will be begun in both prototypes. The international adviser will design the pilot test and describe the potential benefits and issues so that they may be evaluated. A national adviser will assist in this pilot test. The evaluation will be performed in 2003 by the PIOs and the national adviser.

5. The priority and specific outputs from the adviser are:

   a) Prototype 1: Report covering the above scope and including; report and training on options identified, described and those tested. Evaluation of tested or investigated options, including quality control issues. Report on work shops assessments. Recommendations for better survey and mapping methods.

   b) Prototype 2: Report covering the following; documentation and training on options tested and the procedures described for each option. Evaluation of tested or investigated options, including quality control issues. Report on evaluation work shops. Recommendations for improved product and

operational processes. Recommendations on staffing issues associated with the tested options and other input resources.

c) Cadastral Options. An annex listing all cadastral survey options and their advantages and disadvantages is to be completed, with input from the survey control adviser. This will be used for evaluating impacts on survey control (by the Survey Control adviser) and on survey documentation, especially cadastral mapping and survey plan documentation (land parcel mapping adviser).

d) GIS: The pilot GIS is a second priority behind the above options analysis and reporting. A large part of the support for this will be provided by the national adviser.

e) Photomap delays: Since the photomaps due for delivery by NAMRIA are delayed, then the approach will be as follows: a literature search of experiences from other projects such as TLTP and LLTP (both World Bank funded projects in the Region) will be used to document the processes and advantages / disadvantages for CIM production and survey plan completion, and the nature of expected application in LAMP II. Secondly, the TA team should assist on testing these approaches with photomaps in urban and rural when they become available. This should not affect this TOR but could cause a delay in starting input of TA on CIM in activity 27, due to start 1 January 2003.

6. Work with stake holders to develop strategies, organisational linkages and relationships that support Prototype activities.

End

TERMS OF REFERENCE

NATIONAL SURVEY AND MAPPING ADVISER

Second Part of Long Term Assignment (2001/2002)

The PA-LAMP foreshadows a potential 15-20 year program to improve land administration in the Philippines. It is a strategic GOP initiative which aims to support an efficient land market and alleviate the present low level of confidence in the system of formal land registration and the lack of tenure security.

The **Goal** of AusAID assistance, through support of the TA program, is *to assist the GOP to improve the effectiveness, transparency and efficiency of land administration to achieve the resultant flow of economic and social benefits in the Philippines.*

The **Purpose** of the TA program is *to assist the GOP to establish structures and operating procedures for a long term program to reform the land administration system in the Philippines.*

This terms of reference is in respect to the second assignment of the national S&M adviser. The Survey and Mapping adviser to the LAMP Project will work primarily at Prototype 1 (Leyte) and only as required on specific assignment at PIO2 (Quezon City).

The adviser will report to the TA team leader and work as a team with the other TA advisers, in particular the international land parcel mapping adviser, the survey control and systematic registration adviser. The adviser will work closely with Project counterparts.

The approach at all times will provide the Project with best practice, a safe working situation and be Gender sensitive. The adviser will cooperate with the members of the Quality Assurance Panel whose job it is to verify that TA outputs are of a suitable standard and completeness. To this end, the adviser shall maintain an up to date work plan and have regular review meetings with counterparts on progress, issues and changes to the plan.

A monthly report will be submitted to the team leader.

Survey and Mapping Work in Prototype 1

The overall task in prototype 1 is to assist in the development, training, testing and documenting of procedures and methods for mapping land parcels prior to land titling, surveying and mapping of land parcels during systematic land titling and at the time of land registration in order to support the overall first time issuing of land titles. The records must be in sound condition so that they may be kept up to date in the future as transactions occur and as sub-divisions occur.

A number of survey methods are planned to be used including ground surveys, photomaps and satellite imagery. The various survey plans and maps being produced will be reviewed and improved and training provided. The process of parcel mapping must be smoothly integrated with the other titling activities so that the maps are directly used to

control mistakes in duplicating surveys and patent and title issuing. Access to CENRO information is important for identifying earlier surveys and LRA for earlier title registration.

The mapping should be on the standard national coordinate system (PRS 92). Quality assurance must be built into the processes.

Training and workshops will be a feature to obtain consensus on new approaches and for technical skills upgrade. Any additional equipment to improve the work outputs are to be reported. It is planned that both judicial and administrative titling (free patents) will be implemented in target test Barangays.

Further, assistance is to be provided to the OSS and ROD so that the CIM and other land records are integrated into normal work processes so that they are used to avoid errors in issuing fake or overlapping titles. Assistance is to be given on presenting results and recommendations to the LAG and PMO.

Further, assistance will be provided to ensure that the land lot surveys are performed to suitable levels of accuracy and completeness and well documented. This is to include instructions on standard recording of occupations; i.e. boundary monuments, both artificial and natural.

Assistance will be provided in contracting the private sector surveyors and on methods to test and accept the work of the private sector.

Advice should be provided on better filing and keeping of the valuable survey records.

Together with the other TA advisers develop better ways to streamline the overall process of survey, adjudication and office processing, leading to land title registration.

Work together with the systematic land registration adviser to design and document more efficient processes for free patent issuing and registration.

Survey and Mapping Work in Prototype 2

The overall task in prototype 2 is to assist in the development, documenting and training on methodologies and processes to create Cadastral Index Maps (CIM) from existing map data in offices of participating agencies, using survey information and orthopohotos to control the mapping process. Evaluate and report on the quality and completeness of existing survey data held by various agencies. Include a method to ensure that any land parcel sub-divisions / consolidations are captured onto the CIM. The CIM are to be fundamental to the identification of fake, duplicate and missing titles in the Quezon City pilot area and the processes should be integrated with other prototype processes. The integration of the CIM into the OSS and the ROD is a key task in order for the quality of the records to be sustained into the future. The approach will involve community groups in all stages of the work in addition to the PIO2 agencies.

The national survey and mapping adviser will be responsible for completing the following work no later than 30 December 2002 (reference is the PDD and the work to be completed is described as Deliverables 21 and 22 in the AusAid – AMC contract):

1. The top priority specific outputs from the adviser are shown here:

   a) Prototype 1: Assist the prototype to implement the free patent titling test with new streamlined procedures. Advise on the new procedures, assist on training, assist on supervision and evaluation to catch the lessons and improve the processes of administrative titling. In addition, advise the prototype in the preparation the CIM for the free patent titling in rural areas and the judicial titling test in residential areas. Assist in the training of the deputy land inspectors and others. Assist in the selection of contractors as requested by the prototype manager.

   b) Assist the international parcel mapping and survey control advisers in their evaluations of various alternate methods for surveying in support of accelerated titling. In particular, give advice and written analysis on the operational and conceptual advantages and disadvantages of the various alternate approaches. Participate in workshops to catch lessons.

   c) Prototype 2: Assist the international parcel mapping and survey control advisers in their evaluations of various alternate methods for mapping surveying in support of better records management. In particular, give advice on the operational and conceptual advantages and disadvantages of the various alternate approaches. Participate in workshops to catch lessons.

2. Support the continued judicial titling in rural areas as required and its evaluation.

3. Continue to improve the documented procedures and operational manuals for survey and mapping to support the Titling pilots. Prepare relevant training programmes and assist in staff training and training evaluation.

4. Provide assistance to operationalise the OSS at Leyte.

5. Work with stakeholders to develop strategies, organisational linkages and relationships that support Prototype activities.

6. Provide input to the consensus building workshops of the policy studies.

End

TERMS OF REFERENCE

NATIONAL LAND TENURE STATISTICS ADVISER

The National Land Tenure Statistics adviser to the LAMP Project will work primarily at PMO (Quezon City) with occasional visits to the provinces.

The adviser will report to the TA team leader and work as a team with the other TA advisers, in particular, will directly oversight the work of the national land data adviser. The adviser will work closely with Project counterparts.

The approach at all times will provide the Project with best practice, a safe working situation and be Gender sensitive. The adviser will cooperate with the members of the Quality Assurance Panel whose job it is to verify that TA outputs are of a suitable standard and completeness. To this end, the adviser shall maintain an up to date work plan and have regular review meetings with counterparts on progress, issues and changes to the plan. A brief monthly report will be submitted to the team leader.

The qualifications are, experience in developing and documenting and operating GIS applications in land systems, and also, producing reports for management.

The national adviser will lead a team of two persons to compile broad level national land tenure data, essential other census/economic/physical data and produce summary and regional views of the data as an aid for selecting candidate provinces for a future LAMP project. Data quality will be a major issue so in-built checks will be essential. An early decision must be made on the level of aggregation to be used (eg municipal/city or province/city etc) and on the types of data to be gathered. This will be done in consultation with the Project staff and requires the documentation of a user needs analysis so that the system will be well targeted on our needs. Data that is not of primary concern for our analysis will not be collected.

The main tasks are referred to in the work plan as deliverables 20 and 31 include:

Land Tenure System

Deliverable 20

1. Design the land tenure system based on the needs of the LAMP for a system to support decision making about target locations for future titling. Document the needs analysis, the data model, the data entry and checking processes, and reporting.
2. The system is to be based on a standard textual database with some GIS functionality, and to include province and municipal polygons for display and analysis. The Project will provide the software tools.

3. Develop the system on a PC provided by the project and do system checks for performance against the design. Demonstrate to the PMO and make changes as required.

4. Document data collection requirements.

5. Test the prototype system with data from the municipalities of Leyte Province. The TA land tenure data adviser and PMO and PIO1 staff will assist to collect the data. Produce test outputs to verify the full system and documentation. Modify the system and documentation as required.

6. Develop specifications of the data collection phase for the LAMP contractor to perform.

7. Design quality control techniques for the data entry.

8. Provide training on data collection and entry to the contracted staff responsible for the national data capture.

9. Train staff of the Project to manage the system.

10. Provide analysis tools and standard reports and maps.

11. Make a summary report of the system and working guides.

Deliverable 31

12. After the data entry is completed and checked, produce analysis results of the national land tenure situation after consultation with the PMO on the required output.

13. Write a report on the results.

14. Present the results to a workshop organised by the TA and PMO.

GIS System

In addition, the national adviser will work together with the international land parcel mapping adviser to develop, test and evaluate a pilot GIS for use in the LAMP prototypes at Leyte and Quezon City. The purpose is to further improve the quality of the mapping information for use in the land titling and land records management activities.

Initially the system will be designed and a pilot begun in each prototype. This will include training and it will see the output by PIO staff of CIM. A brief report on the system objectives, characteristics and advantages / disadvantages will be made as part of the TA's main reports on deliverables 21 and 22.

During the first half of 2003 the main testing, training and evaluation will occur. Workshops will be used to convey the findings to a wider audience of the potential benefits of GIS in a future LAM Programme. A report on the evaluation will be produced and will form a part of the TA's main reports on Deliverables 25 and 27.

The Project will provide the GIS software and PC equipment, as well as a scanner and plotter.

Priority

This GIS task will be undertaken in parallel with the land tenure study but the land tenure study will be given the higher priority. It is planned that during the data collection phase of the land tenure study that the GIS work will proceed.

End