

PUNJAB LAND RECORDS SOCIETY

Office of Director Land Records
Kapurthala Road
Jalandhar
Punjab – 144 002

Reference No 001/2009
Expression of Interest
Invited for

**Updating of Cadastral Maps(Mussavis)using
DGPS, Remote Sensing, Ground survey and GIS
Technologies for the districts of Jalandhar &
Bathinda.**

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Section 1: Introduction

Under the centrally sponsored scheme, National Land Record Modernization Programme (NLRMP), this project is envisaged for Digitization, Survey and Updation of existing Cadastral maps and Development of core Cadastral Information System. This project aims to develop modern and comprehensive land records management system in the State of Punjab with the aim to implement the Conclusive Land Titling System with Title Guarantee, incorporating the "Mirror" Principle which refers to the fact that Cadastral Maps mirror the ground reality.

This project is to be implemented by the Department of Revenue, Rehabilitation and Disaster Management through Punjab Land Records Society. In this project Punjab Remote sensing Centre, Ludhiana will work as nodal agency. To begin with, this project will be launched in two districts i.e. Jalandhar and Bhatinda to be implemented over a period of one year.

Section 2: Objectives

1. Digitization of cadastral maps using scanned Musavis, High Resolution Satellite Imagery (HRSI) and integration with Records of Rights (RoR) in GIS layers depicting Geographic information (the property co-ordinates, the actual measurements as per ground reality and musavi), attributes information (based on RoR Survey Performa), its interlinking with optimum precision.
2. To generate integrated, Geo-referenced village/tehsil/District mosaic of cadastral maps.
3. Capture most of the features of the Land surface specially the built up Area, so far not covered under the existing musavi maps.
4. The citizens should be able to obtain the drawing of their properties alongwith dimensions, area (as on ground and also as per RoR), attributes and neighborhood details.
5. The property maps should be able to integrate with the property registration software, Record of Rights and web application.
6. To enable better planning of resources.
7. To enable more revenue generation in Property Transactions, house tax collections, monitoring of Govt. lands, Sale of excess land to be identified by the survey etc.
8. To identify the encroachments on public/private properties.
9. This survey followed by settlement should lead us towards Conclusive Titling.
10. Help in Disaster Management

11. To shift to metric system of land measurements.
12. Additional benefits like identification of properties for crop compensation, crop insurance, encumbrances etc.

The Expression of Interest is invited from interested and eligible parties to present best possible methodology and technology to achieve the above mentioned objectives of the project.

Section 3: Scope of work

The process of creation of Cadastral Information System (CIS) will involve Geo-referencing of High Resolution Satellite Image (HRSI), Digitization/redrawing of Mussavis, Field Verification, Public Validation, Attribute addition, linking with RoR and fixing Sehadda stones. After the successful completion of this job, the vendor should provide support for 3 years for maintaining record, updation, imparting training etc.

The Punjab Remote Sensing Centre, Ludhiana (PRSC) or any other project consultant will act as a nodal agency to provide technical support, accuracy checking, ground validation of data etc. The nodal agency will work in association with PLRS, Jalandhar and will monitor and present weekly progress of all vendors.

The detail scope of work is given below and will subject to change based on feed back from vendor and approval of Nodal agency:

Image Registration: The vendor will be provided Quick bird / Worldview satellite imagery of single PAN/Aerial Photography. All the Vendors will have to give an undertaking for maintaining the secrecy of data as required by the Remote Sensing data policy of NRSC, Department of Space, Govt. of India.

- a) The nodal agency will assist in demarcation of tentative GCP locations on image for collection of DGPS coordinates by vendor. The GCPs will be collected with uniform distribution with an average of one per square Km. More GCP locations may be demarcated where ever it is felt necessary.
- b) The client will provide Survey of India Ground control coordinates to the Agency who in turn will sign an undertaking as per the prescribed norms for maintaining the

secrecy. The SOI coordinates will form the basis for collections of further GCPs.

- c) This Survey should be done by the DGPS instrument with high accuracy (10 Cm or less).
- d) Thereafter, the Agency will register HRSI with the GCP data. The nodal agency will check the accuracy and Root Mean Square Error (RMSE) error. The RMS error between the DGPS Points and actual Image coordinates should be less than half a pixel. During the process, some GCPs which contribute more error will be removed and shall not be counted for making the final payments.
- e) The scanned musavis on minimally 300 dpi will be provided to the vendor for further registration on HRSI
- f) All *Sehadas*(Tri junction points of villages) should constitute the GCPs and replace the nearest GCP. Wherever it is possible, GCPs should be taken on the village boundaries.
- g) The Agency will be responsible to provide detailed description of the locations (Photographs) where a GCP is collected and transfer the DGPS coordinates on HRSI. The photographs should precisely define the locations so that image registration can be done smoothly. The GCPs should be easily identifiable on the ground.
- h) The vendor agency should deliver DGPS coordinates of at least 500 per month. They should deliver the data and register the image on the first working day of the week and inform the client about the same through a weekly report.

Digitization: The process of vectorisation is assumed as redrawing to achieve maximum possible accuracy. Redrawing of entire village will be done in continuous process with the help of referenced Mussavi sheets with HRSI. During the process of redrawing, error rectification and updating should be done. The methodology to be followed in creation of cadastral map will be as follows:

- a) The centre line of the roads/canals will be digitized to form a base layer, a buffer on these features has to be generated as per the dimensions mentioned in the Mussavi sheet. Thereafter, the fields should be digitized to fit in-between the permanent features. The digitization should be done from

core to the outer i.e. from built-up(*lal lakir*) to the village boundaries.

- b) The missing (the features present on the ground but not on Mussavis) and invalid (the features present in Mussavis but not on the ground) features should be digitized and reflected in separate layers.
- c) Updated geo-referenced Mussavis on the scale 1:2640 should be combined with Urban Mapping at 1:1000. The Mussavis should show the roads/canals/water bodies/railway lines as existing, missing or invalid features in separate layers.
- d) The property dimensions and area should be shown in the metric system as well as the traditional system.
- e) The details of the properties should be shown in the attribute table (Area as per RoR, Ownership details etc) along with actual ground dimensions. Comparison of area and dimensions should be done.
- f) Encroachments, excess areas and measurement discrepancies should be highlighted (different color scheme) in the Mussavis.
- g) **The precision in linear and area measurements should be 99%. Accuracy of 30 cm on ground should be achieved.**
- h) **GIS Mapping and Surveying:** The client will provide the Computerized Records of Rights data in 12 columns in backup files of Sql Server 2005. The Agency should integrate this data with the digitized map and bring out the discrepancies i.e. the RoR data vis-à-vis the Mussavi map vis-à-vis the Ground position. The Agency would then survey (Through DGPS/ETS/Plane Tabling) and record the field observations with regard to the (should be) RoR entries, khasra-wise with regard to ownership, cultivating possession, source of irrigation, property valuation and if any construction, then the details as asked in the built-up survey etc. The agency will procure all data required for 100% matching of RoR with the digitized cadastral map through updating of Mussavi Sheets with the help of Satellite Imageries (HRSI) and ground survey. The Agency will submit the fortnight survey report to the nodal agency and client who in turn will get it verified. (it is to be noted that the client has undertaken a contract with Microsoft Ltd. in which ESRI is supposed to develop the GIS Module. So, at present the development of GIS software

module is not within the scope of work, however, the client reserves the right to include it as scope of work).The additional details to be collected during the survey are given in annexure-III

Built-up Survey: The built-up survey should be done on 1:1000 scale by the following methodology:

- a) Detailed mapping of built up area should be done using HRSI for rural and urban habitations.for Jalandhar and Bathinda towns where aerial photography data may be supplied.
- b) Assigning Unique Property Identification Number (GIS based) as per Land code developed by NIC (available at <http://dolr.nic.in>) and to integrate with the Registration software (specifications can be downloaded from the website of PLRS or can be asked from the DLR's office).
- c) The survey Performa to be filled up by the property owner/occupant will contain the details as per annexure-II. The vendor will collect data on the survey performa and link it with each property.
- d) For the properties where a property owner/occupant does not provide the details to the Agency, the Agency should submit a weekly report to the client in the form as Annexed at Annexure – 5. The vendor will revisit all such properties.
- e) Photograph of front elevation of each building should be taken and indexed to link with map. The coordinates of property boundaries/dimensions as they exist along the road side should be obtained (using ETS/plane tabling or any accurate device). The detailed land use should be collected during the survey.
- f) The Agency will deliver the built-up area maps in GIS shape file format with all attributes as per Annexure-II to the nodal agency. Also, a printout of map on A0 sheet on 1:2000 scale along with soft & hard copy of attribute data on excel sheets should be provided to the client on fortnightly basis starting after one month.
- g) The client should return the map within one month after cross checking and satisfying itself. The Agency should update the details, rectify the errors and submit the final

output to Nodal Agency within a fortnight. The nodal agency should check that all corrections have been duly incorporated and report the same to the client.

Sehda Stone: There should be one revenue stone (including Sehdas) per sq.Km as per the location of GCPs. The nodal agency will assign a unique ID and location coordinates to every revenue stone (including Sehdas). The data about the exact geo-referenced coordinates of Sehdas & other revenue stones should be communicated to the nodal agency.

The Sehdas and revenue stones should be inscribed with unique code for access of coordinates. The structure of stone will be described in the RFP.

Land use: The Agency will collect detailed land use of the study area as per annexure-VI .

Others details: The agency should provide the mosaic output in shape file or geo-database format for each village, each tehsil and district on DVD in duplicate.

Geo-referenced raster data of musavis also should be provided on DVD with proper codification and index. Retrieval software should be provided.

Technical report on each village should be created as per the format decided by nodal agency, PLRS and the selected vendor.

The bidder will be bound by the guidelines issued under National Land Records Modernization Programme (NLRMP) available at their website DoLR.nic.in.

Apart from English, the Surveyed data also be entered in Punjabi using Unicode Standards.

- Note:**
- 1. Vendor agency should provide the option on supply of HRSI/Aerial Photography data on its own or by the client.**
 - 2. PLRS reserves the rights to restrain the scope of work at any time.**

Deliverables:

- The deliverables consists of geo-referenced soft copy of scanned mussavis on DVD
- Final maps of village mosaics on DVD with all attributes as mentioned in the document
- Final maps of tehsil mosaics on DVD for each district
- Final maps of district mosaic on DVD for each district
- DGPS coordinates of Sehada and revenue stones along with codes
- The Mussavi wise printout on polyester matt paper
- Technical report on each village

General Conditions:

- a. The nodal agency will monitor the work progress of Agencies and send a fortnightly report to the client.
- b. The Agency will provide GIS/MIS reporting on case-to-case basis. For instance like how many fields are affected due to change in the course of a river? The field-wise detail of the total area involved in a village wherein there are measurement discrepancies or encroachments should be reported.
- c. Assignment of Unique Property ID Number as per the Land Code developed by NIC & PLRS and to integrate it in a standardized manner with the built-up property ID codes which in turn have to be allotted by the Vendor Agency.
- d. Technically qualified bidders will be given one village each for redrawing and mosaic creation. Based on the evaluation of output further points will be allotted
- e. After conducting independent studies, the short listed vendors would attend a one-day workshop, to finalize the System Requirement Specifications in discussion with the Nodal agency and PLRS.
- f. After final technical qualification the qualified bidders will be given Request for Proposal (RFP) document for submitting their price bid.
- g. The work will be allotted cluster-wise. One Agency will be allotted only one cluster to begin with. Further allocation of another cluster to an agency will be done after the successful completion of 100% of DGPS work, 50% of digitization of cadastral maps and 50% of built-up survey assigned to a particular agency. The Four clusters are:

- (i) Cluster 1: Tehsils Jalandhar-I and Jalandhar- II
 - (ii) Cluster 2: Rest of Jalandhar District.
 - (iii) Cluster 3: Tehsil Bathinda.
 - (iv) Cluster 4: Rest of Bathinda District.
- h. The Agency should setup its office within the Cluster/district, after due approval of the Client and abide by the regulations as determined by the Remote Sensing data policy as laid down by the NRSC, Department of Space, and Govt. of India. The Agency will setup its hardware and Software as required and will adhere to rules and regulations. The agency should give an undertaking to this effect.
- i. The Agency should follow whole to part approach during the land survey so as to fit with the adjoining areas.

Time Duration:

- a. The Agency should complete the work of one cluster within 6 months. A time schedule for deliverables and work progress should be prepared by mutual discussion with the client within a week of the allocation of the work.
- b. The work should commence within a month of signing the agreement and allocation of the work.
- c. The survey area will include areas like those of city centers, planned areas, slums, village abadi areas (inside and outside lal lakir), sparsely spread out hamlets etc.
- d. The revenue stones should be installed on all GCPs.

Eligibility

The documentary evidence of the bidder's qualifications should establish to the PUNJAB LAND RECORD SOCIETY's satisfaction that the bidder is eligible as per the criteria listed below:

1. The Party should not have been blacklisted by central/state Government departments or debarred or should not found indulge in any unethical practice. (A notarized undertaking on Rs. 100/- stamp paper should be submitted to this effect).
2. Due to confidentiality of the data no outsourcing of HRSI/DGPS/GIS related work would be allowed. However, bidder can outsource the work relating to built-up survey, attribute data

collection and installation of revenue stones, under his supervision. An affidavit on Non-Judicial stamp paper duly attested by 1st Class Executive Magistrate / Notary Public should be submitted to this effect.

3. Bidder must have ISO 9001:2000 Quality certificates in its company's name or must be SEI-CMMI Level 3 or above in IT or related services.
4. Bidder should have point of presence in Punjab or agency have to give undertaking for opening local work centre/office with required infrastructure within two weeks time in case agency is selected for executing this job.
5. The agency/agencies should be registered with Service Tax Department [Enclose attested copy of the Service Tax Registration number]. The agency/agencies should have minimum 25 regular IT professionals as employees working with the company.
6. Either the firm or the main consortium partner should have minimum average Annual Turnover of Rs. Fifteen Crores for the last three years. Or it should be a Government agency with at least three years working experience in the same field. If it is consortium then each other consortium partner should have a minimum average turnover of Rs. five Crore for the last three years.
7. Bidder or consortium partners must have the turnover of not less than Rs. 5 crore in each of the last 2 financial years from the services related to Scanning, digitization, GIS & RS, and Survey related works. The proof of same has to be mentioned in the undertaking.
8. Bidder has to submit a certificate stating the capability to handle 3 or more sites at the same time. Proof of the same should be submitted stating that they have handled 3 or more large volume projects at multi locations in India for any of the related services from Scanning, digitization, GIS & RS, and Survey for last 2 financial years.
9. The Party should provide an undertaking on letterhead of owning the hardware to be required for executing the work & should have premises and necessary infrastructural facilities to acceptable

standards necessary to perform the functions required in jalandhar or it should establish such facility within 15 working days of award of Work Order.

10. The Bidder must have highly qualified and experienced person in GIS and RS who is capable to execute projects related to Cadastral Information Systems. The overall employee strength of the company should not be less than 200 (The agency/agencies shall submit a copy of the annual return submitted to EPF/PF Commissioner in support). The details of top level management to be attached with bid document.
11. The company or any one of consortium partner should furnish a certificate from nationalized/scheduled bank/Chartered Accountant in support of its positive net worth along with credit worthiness certificate equivalent to Rs. Ten Crores.
12. PLRS reserves the right to accept and / or reject any bid, wholly or in part based on strengths & capabilities of the bidder.

Section 5: Expected Schedule of Work

Sr.No.	Activity	Agency/Target	Time (weeks)
1.	Procurement order for HRSI	PLRS/Vendor	1
2.	Provide GCP location specifications to Agency	Nodal agency will help locate GCP	1-2
3.	GCP coordinates collection by agency	500 per month	2-14
4.	Registration of GCP on HRSI	Vendor	6-15
	Nodal agency will monitor the process and accuracy	Nodal agency	
5.	Built-up Survey by the Agency	25% of allotted work per every 4 weeks should be submitted to	2-16

		Nodal agency	
6.	Built-up Survey Maps verified by Nodal Agency	Month	6-20
7.	Built-up survey maps + GIS data (Hard & soft copy) to client	Nodal agency on every month)	10-24
8.	Field verification of Built-up survey	Client will return within a month	12-28
7.	Incorporation of Built-up Survey Maps	Nodal agency	14-30
8.	Supply of scanned Mussavis to Nodal agency/Vendor	Client	Cluster 3 and 4 in week 0; cluster 1 and 2 in week 5.
9.	Mussavis Geo-referencing and updating from SI and delivery to client	Vendor agency 1500 maps per month	7-35
10.	Field verification of Updated Mussavis	Client/1500 per month	11-39
11.	Error rectification in Mussavis, incorporation of built-up survey and final delivery	Vendor agency 500 maps per week	17-45

Section 6: Support to be provided by the client (Roles and Responsibility):

Punjab Land Records Society (PLRS) will coordinate and provide the support of Patwaris for field verification and public validation. Necessary public notification will be issued for collection of property attributes from Urban and Rural built-up area. The client support involves the following:

1. Supply Survey of India triangulation coordinates to Agency.
2. Supply the data of scanned Mussavis to Nodal agency/vendor.
3. Design Performa for built-up survey for Vendor.
4. Field verifications of updated Mussavis as provided by Vendor.
5. Field verifications of built-up survey provided by Agency.
6. To bring about legal changes wherever required to enable updating of records as per ground reality/field Validation.

7. Interaction of client (PLRS official with local govt.) with Nodal agency and Vendor.
8. Authorization and manpower support to vendor agency for accessing public property on behalf of PLRS for collection of data
9. Appoint nodal agency or consultant and form internal committee to attend the requirements of vendor agency in performing their functionalities.

Annexure – I

Forwarding Letter

The Director Land Records
Kapurthala Road
Jalandhar
Punjab – 144 002

Sub: EOI for Updation of Cadastral Maps (Mussavis) using DGPS, Remote Sensing,
Ground survey and GIS Technologies for the districts of Jalandhar & Bathinda.

Dear Sir,

1. With reference to your E O I document dated ---.---.2009, I/we, having examined the EOI document and understood its contents, hereby submit my/our application for getting short-listed for above services. The application is un- conditional.
- 2 All information provided in the Application, Appendices and Annexure is true and correct and all documents accompanying this application are true copies of their respective originals.
- 3 I/ We acknowledge the right of the Authority to reject our application without assigning any reason or otherwise and hereby waive our right to challenge the same on any account whatsoever.
- 4 I/We certify that in the last three years, I/ we neither failed to perform on any assignment, as evidenced by imposition of a penalty or a judicial pronouncement or arbitration award, nor been expelled from any assignment or contract nor have had any contract terminated for breach on our part.
5. I/We agree and undertake to abide by all the terms and conditions of the EOI document.

In witness thereof, I/We submit this application under and in accordance with the terms of the EOI document.

Yours faithfully,

(Signature of the Authorized Representative)
(Name and designation)
Name and seal of the Firm

Annexure- II

In urban mapping the following details need to be collected and linked to various layers. Each feature will be linked to the feature ID, unique features IDs should be generated and take approval of the client for finalization. The attributes listed below are not limited but any features other than the mentioned below also need to be collected and linked.

1. Road Name
2. Road Category
3. No. of lanes
4. Pavement/surface type
5. Park Name
6. Drain Type
7. Drain Width
8. Flow Direction
9. Capacity of transformer
10. Name of the Drain / Nalla / River
11. Cross Drainage (Bridges / Culverts)
12. Name of the Flyover / Grade Separator
13. Type of Lights
14. Pole Type
15. Pole No
16. Type of public tap or hand pump
17. Type of water tank
18. Details/Status of water tank
19. Type of bore well
20. Details/Status of bore well
21. Length and width of parking stretch
22. Bus Shelter

PROPERTY DATA (For each property)

1. Property ID
2. Property No (Old & New)
3. Floor No
4. Flat No
5. Block No / Name
6. Total No. of Floors
7. Owner's name
8. Building Name
10. Correspondence Address (Block / Phase, Street, Locality, Pin code)
11. Telephone No

12. Land Area
13. Length: Along the road
14. Built up Area (Residential / Tenanted, Res. Self Occupied, Non res tenanted, Non res – Self occupied)
15. Property Usage
16. Ownership Status
17. Digital photo of front portion

Annexure-III

Cadastral Survey format for the plots surveyed using ETS and GPS :

1. Name of the land owner
2. Is the plot subdivided
3. Reason for subdivision
4. Who are the other owners in case of subdivision
5. Is there is change of land use
6. What is the total and individual areas of all plots under survey
7. Reasons for discrepancy in area

Annexure-IV

Land use data collection format:

During satellite data / aerial data interpretation and land base data collection the following land use details should be collected and provided as a separate layer in GIS

1. Current Land use and Land use as per records
 - a. Commercial / residential / spiritual / others specify
 - b. Burial ground
 - c. Gram sabha land
 - d. Agriculture land converted to roads
 - e. water body
 - f. Infrastructure
2. Soil Type
3. Source of Irrigation
4. Any other

Annexure-V

In case of urban survey and mapping if the building is locked or inaccessible the details should be intimated to the client or his authorized person in the following format:

1. Name of the property owner
2. Street name
3. Locality name
4. Building number
5. Reasons for inaccessibility
6. The available data of the property as per details given
7. Date of visit / re-visit
8. Name of the Survey supervisor