

NAMRIA commences inter-island benchmark connections

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NAMRIA commences another programmed activities under the Geodetic Network Development component of the PRS92 Project, the inter-island benchmark connection. The first of the ten clusters of benchmarks was already observed by the NAMRIA MGD. The benchmarks included in the first cluster are located in: Batangas City, Puerto Galera in Oriental Mindoro, San Jose in Occidental Mindoro, Puerto Princesa City, Malay in Aklan, and Mogpog in Marinduque.

The survey will determine the vertical relationship among the benchmarks distributed among the

Philippine islands. These benchmarks are located very near the tide gauges where the MSL is being determined through a 19-year lunar cycle observation.

The connection will give an idea about the differences of the MSL surfaces of each of the tide gauge benchmarks. This information will be used in the computations and adjustments of the national vertical network. It will also be useful in the formulation of a geoid model for the country, thus homogenizing the country's vertical network. The remaining clusters will be observed within the year.



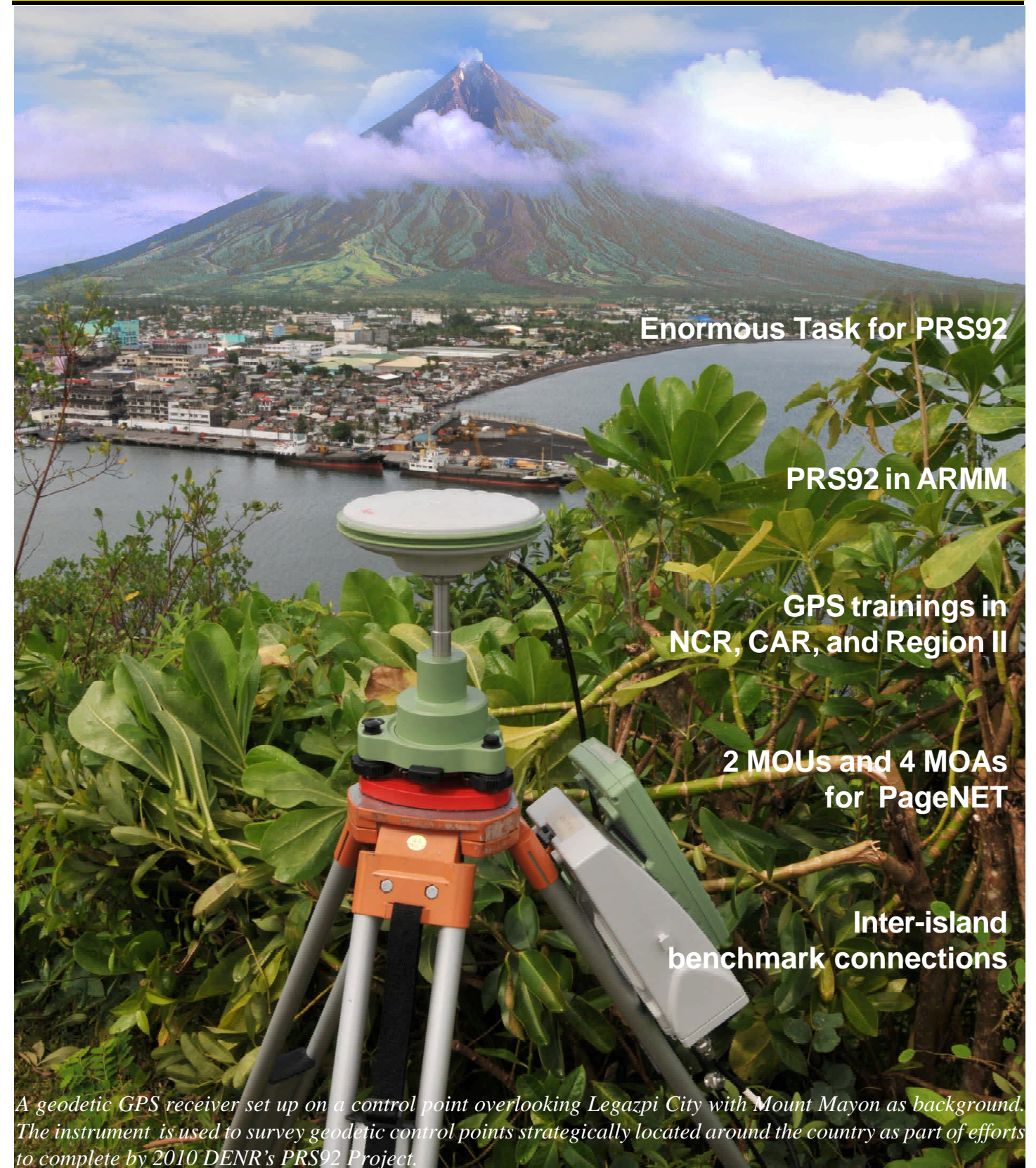
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Enormous Task Ahead

by USec. Diony A. Ventura, MNSA
NAMRIA Administrator



Undersecretary Diony A. Ventura, MNSA
NAMRIA Administrator

Not minding the heat of the sun, a survey team is busy working along a national highway, setting up the GPS receiver on top of a marked concrete monument. One of them is carefully checking the instrument from time to time while the other is accomplishing the *GPS field sheet* for use in post processing of data. It will take them several hours to complete the observation, done simultaneously with at least two (2) other more teams from adjacent locations. These teams will be constantly communicating with each other for a coordinated and synchronized scheduling of observations. They are establishing a geodetic control point or *mojon* on a typical day for the Philippine Reference System of 1992 (PRS92) Project. There are about 42,000 *barangays* in the whole country with at least a pair of GCPs to be established per *barangay*.

In the different local government offices around the country, Department of Environment and Natural Resources (DENR) officials and employees are painstakingly explaining the importance of the project to local chief executives and constituents.

In the different DENR regional offices, we are also currently transforming and integrating all the cadastral surveys and maps of the Land Management Sectors of the DENR to help resolve and minimize overlaps and

other inaccuracies. A total of 14,617,012 lots are targeted for integration. The task to implement the PRS92 Project is certainly enormous.

Prior to 1992, the national geodetic control network known as the Triangulation Network of the Philippines (TNP) was comprised of narrow chains of triangles and quadrilaterals. There were difficulties in expanding the TNP owing to the limitations of the surveying instruments used and the unreliable connections of local and national networks.

From 1987 to 1991, the DENR implemented the Australian government-assisted Natural Resources Management and Development Project (NRMDP) to support the improvement of the existing network. The new system, now known as PRS92 was approved by former President Fidel V. Ramos through the issuance of EO 45 dated 05 January 1993. PRS92 will serve as a common reference system for the accurate surveying and mapping of natural resources, administrative and cadastral boundaries and set the year 2000 as the deadline for the integration of all surveys and maps into the new system. EO 280 dated 14 August 2000, however, was later issued by former President Joseph E. Estrada extending the deadline of the integration to 2005. In the two presidential issuances, no agency was designated to oversee its implementation, and so monitoring compliance was never done.

Upon the recommendation of various private and government offices engaged in surveying and mapping during the PRS92 stakeholders conference in 2003, and the subsequent regional focus group discussions, EO 321 dated 02 July 2004 was issued by President Gloria Macapagal-Arroyo, further extending the deadline to 2010. The EO also directed DENR to allocate funds and designate which office will oversee the implementation of the order.

PRS92 ensures a unified, consistent, and reliable geographic information database used in many planning and policy/decision-making activities of both government and private organizations. These activities include, among others, land reform and administration, infrastructure and energy development, social and environmental initiatives, marine and ocean affairs, disaster and risk mitigation, and scientific and engineering studies. PRS92 also seeks to improve the

...continued on page 7

Gravity survey training held

by Carmi D. Laylo
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A training on gravity survey was held in NAMRIA on 11-13, 16 February 2009. The training was conducted to equip the Gravity Survey team of the PRS92 Project with the technical skills and knowledge which are essential in the execution of gravity survey for the establishment of first-order Gravity Stations nationwide. Mr. Richard Lachapelle, the International Sales Manager of Scintrex Company based in Canada, conducted the training of selected MGD staff on the operation of the CG-5 Gravimeter.

On the first day, Mr. Lachapelle gave a brief discussion on gravity theory and gravity reduction. He emphasized the importance of gravity survey and presented the accessories, functions, and menus of the state-of-the-art equipment. Aside from providing tips on the basic maintenance of the unit, he also demonstrated its operation to illustrate the data acquisition process.

On the second day, the participants were tasked with operating the gravimeter during the practice survey conducted within the NAMRIA grounds. Mr. Lachapelle also demonstrated the uploading of the acquired data from the CG-5 to a personal computer.

The application of concepts and technical skills was carried out in a larger scale during the conduct of actual gravity survey of the NAMRIA-Muntinlupa-Tagaytay Loop by the participants and the trainor-facilitator. For this activity, the group measured the gravity at the gravity station in NAMRIA; a benchmark in *Libingan ng mga Bayani* (BM66); a triangulation station in Muntinlupa (MAG-1); a point near the AGS in Tagaytay City (PTGY); and a GPS station in Mendez, Cavite (CVT-3022).

During the closing ceremony for the training program, a certificate of appreciation was awarded to Mr. Lachapelle. The closing remarks were provided by MGD Director Jose Galo P. Isada Jr., and MGD OIC-Assistant Director Randolph S. Vicente.

Enormous Task....from page 2

economic status of the country, alleviate poverty, promote sustainable development, and support public order and safety.

We are now in the second quarter of 2009 and a lot of work still needs to be done. There is no reason why we cannot achieve the goals of the PRS92 Project. We have the firm support of DENR Secretary Jose L. Atienza Jr., and the steady collaboration of our agency's co-



Actual gravity survey at the triangulation station in Muntinlupa City



NAMRIA MGD Director Isada awards a plaque of appreciation to Mr. Lachapelle.

implementers-- the Lands Management Bureau (LMB) and the different DENR Regional Operations Committees-- backed by the assistance of the Geodetic Engineers of the Philippines and the cooperation of the local government units. Our men will continue to traverse the whole archipelago in order for us to fully gear up PRS92 by the year 2010.

GPS trainings held in NCR, CAR, and Region II

by Aubrey George T. Corpuz
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The IEC Task Group conducted a series of seminars on GPS Data Processing and Evaluation to three regions: the National Capital Region (18-27 February), the Cordillera Administrative Region (09-13 March), and Region II (22-28 March). Part of the Task Group's continuing Regional Technical Education Program, the training (1) equipped the regional PRS92 technical staff with sufficient knowledge and expertise on the use of the newly-acquired GPS equipment in observation and

data processing using the Trimble Geomatics Office software; and (2) gave them ample knowledge on how to evaluate, manage, and analyze their respective data and on how to design the network before executing the survey activities in the region.

The NAMRIA team also assessed the accomplishments of the three regions. They inspected established GCPs in order to validate regional accomplishments.



Inspection of a GCP located near the signage of Cagayan Electric Cooperative II area coverage



LCdr. Gatchalian orients DENR-CAR technical staff on the basic configuration of the GPS receiver.

2 MOUs and 4 MOAs... from previous page

project, while PAGASA will share weather observation data gathered by their monitoring stations.

The first MOA was signed on 29 January 2009 by Administrator Ventura and Legazpi City Mayor Noel E. Rosal. The second MOA was signed on 05 March 2009 with PN Flag Officer in Command Vice Admiral Ferdinand S. Golez at the PN office in Roxas Boulevard, Manila. The third one was inked with NVSU President Dr. Marilou S. Gilo-Abon on 16 March 2009 at the NVSU Mini-Theatre in Bayombong, Nueva Vizcaya. The fourth MOA was signed on 19 March 2009 with Leyte Governor Carlos Jericho L. Petilla. The four MOAs aim to formalize the arrangement for the hosting of the AGS to be established in Legazpi City, Naval Reservation in Puerto Princesa City, NVSU, and Leyte.

The establishment of the PageNET, also referred to as the *Continuously Operating Reference Stations*, is under the *Development of the Geodetic Network Component* of the PRS92 Project.



NAMRIA Administrator Ventura (second from right, seated) and NVSU President Dr. Gilo-Abon (third from right, seated) sign the MOU for the establishment of an AGS in the NVSU Bayombong campus. Witnessing the ceremony are the key officials of NAMRIA, faculty members of NVSU, and representatives from the DENR Provincial Environment and Natural Resources Office.

Preparation for PRS92 in ARMM underway

by Concepcion A. Bringas
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NAMRIA Administrator Diony A. Ventura has sent two teams to the Autonomous Region of Muslim Mindanao (ARMM) to coordinate with the officials and technical staff and gather data for the implementation in the region of the PRS92 Project in 2009 and onwards.

The initial meeting between the NAMRIA representatives led by Deputy Administrator Peter N. Tiangco and ARMM officials headed by Regional DENR Secretary Kabuntal P. Emblawa, Al-haj, was held on 18 February 2009 at the regional office in Cotabato City. An overview of PRS92 was presented and topographic maps of the region were turned over to the ARMM officials during the meeting. In his message, Secretary Emblawa, Al-haj gladly received the NAMRIA visitors and said they looked forward to the implementation of PRS92 in ARMM. He also designated ARMM LMB Director Brahim B. Andamen as the ARMM point person for the PRS92 Project.

Mapping and Geodesy Department (MGD) Assistant Director Audie A. Ventirez led the NAMRIA team in a follow-up visit to the region on 09-13 March 2009. The team conducted an inventory of cadastral and other ENR datasets for data conversion and assessment of Information and Communications Technology and human resource capabilities, and of the existing mechanism for Information, Education, and Communication (IEC). The locations of the concerned units were visited, point persons were interviewed, and survey forms were distributed. The results of the inventory and assessment were presented to the officials and technical staff of DENR-ARMM led by Alindatu K. Pagayao, Assistant Secretary for Administration and Finance and concurrent director of the Forest Management Bureau. Also in attendance were the directors of LMB, Protected Areas and Wildlife Bureau, Ecosystems Research and Development Bureau, and Regional Public Affairs Office. The group also established linkages with point persons for concerns on Geodetic Network Development, Data Transformation and Integration, Geodetic Network Information System (GNIS), and IEC campaigns.

Also conducted during the visit were demonstrations on the Land Survey Data Management System and the GNIS and on Manifold Software. The staff of the Records and Management Section were given an initial hands-on training on cadastral data encoding using the Excel Template since this can be immediately utilized by the region.

Secretary Emblawa, Al-haj was grateful to the NAMRIA Administrator for providing his agency with a computer unit and sending the NAMRIA team for the assessment activity. He said that he will communicate with the Administrator to request for assistance in the preparation of the ARMM PRS92 work plan for submission to the Department of Budget and Management. Assistant Secretary Pagayao in turn acknowledged the region's deficiencies in data management, technology application, and information technology skills. He said that they are looking forward to NAMRIA's provision of support for training and of equipment through the PRS92 Project.

A NAMRIA integrated plan to implement the PRS92 Project in ARMM for CY 2009 is currently being finalized. The initial activities to be undertaken are training sessions and information campaigns for the respective technical staff of the DENR-ARMM provincial and central ENR offices. Later activities include densification survey, leveling, cadastral and other ENR data integration, and regional social mobilization. The activities are tentatively programmed to start in May 2009.

Aside from DA Tiangco, the NAMRIA team that made the initial visit also included Mapping and Geodesy Department (MGD) Director Jose Galo P. Isada Jr., Joselito T. Reasol of the Development Studies and Standards Office, and OIC Nicandro P. Parayno of the MGD Aerial and Spatial Surveys Division. The succeeding composite team led by MGD ADir. Ventirez included Joselito T. Reasol, Concepcion A. Bringas of IMD, Aurea O. Virtudazo of the Remote Sensing and Resource Data Analysis Department, Bryan M. de Guzman of MGD, and Renato Eguia of IMD.



NAMRIA MGD Assistant Director Ventirez (fourth from left) represented Administrator Ventura in turning over the memorandum receipt of the computer unit to DENR-ARMM Regional Secretary Emblawa, Al-haj (second from left).

Training held on new tide station instrument

by P/Ens Gilbert A. Alviola
Hydrography Department, NAMRIA



Participants listen to lecture of Mr. Traum

The NAMRIA Hydrography Department (HD) conducted a training seminar on the operation of the Stevens water level chart recorder (model AO71) on 26-27 February 2009 at the HD boardroom in Binondo, Manila. The new instrument will be used in recording the water level changes in various tide stations in the country for the tide station component of the ongoing PRS92 Project.

Lloyd Traum of Stevens Water Monitoring Systems, Inc., from Portland, Oregon discussed the operation of the Stevens Type A Model 04 water level recorder. The mechanical device uses a quartz multispeed timer as a chart driver. It works with alkaline batteries and a float pulley with a circumference of 375 mm that uses a stainless steel beaded float line. It operates under a temperature of zero to plus-forty degrees Celsius. Traum described in detail the assembly of the apparatus especially how to replace a new roll of strip charts once the old one runs out. He also presented the AxSys MPU system, an electronic attachment to the water level recorder (using an A/F encoder) which processes, formats, and stores data in a Flash memory and with an independent time-interval setting stored in a battery-backed real-time clock circuit. The unit also has a four-key keypad and an alphanumeric LCD.

Traum also trained the participants on the operation of the AXREAD, the software application to be used in downloading the data from the above devices. He also showed the participants the other water monitoring products from Stevens that can be used in various technical fields.

Some facts and issues about PRS92

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Executive Order No. 45, as amended by EO No. 280 and EO No. 321, mandates the adoption of PRS92 as the standard reference system for all surveys. As such, all surveys and maps shall be referred to the new reference system.

PRS92 is a national network of points on the ground whose positions are accurately determined using the Global Positioning System (GPS) transformed into PRS92 coordinates via the seven parameter transformations. These points are marked on the ground with concrete monuments or cement putty and are found in schools, government offices and other conspicuous places.

Some issues about PRS92

There were instances in the past when some engineers tried to test the consistency and reliability of PRS92 with respect to relocating lot corners in the old system. It was observed that the resulting position does not conform to that of the old system. They also tried to compute the azimuth of a line between two BLLMs using GPS derived coordinates and compare it to the old survey. The resulting azimuth was also a little different. Because of these, some people doubted the accuracy and reliability of PRS92.

What caused the discrepancies?

Back then (from 1901 until the 1960's), geodesists used crude instruments like chains and old theodolites in executing triangulation surveys. Also, the old survey practices were under the assumption that the geoid and ellipsoid separation is zero and the two were made to fit each other at the origin. This assumption led to a systematic error as the network is extended away from the origin. The geoid represents the true figure of the earth, while an ellipsoid model represents the mathematical shape of the earth where geodetic computations are reduced and computed at the ellipsoid surface. With the zero separation assumptions, they used the elevation above mean sea level (MSL) heights instead of ellipsoidal heights in geodetic computations.

Geoid and Ellipsoid

The geoid is an equipotential surface where the force of gravity is constant. This geoid correspond to the surface of the MSL. The force of gravity is affected by the density of rocks and minerals underneath the surface of the earth, causing it to rise on more dense regions and fall on less dense regions. Meaning, this surface is of irregular shape and it represents the true shape of the earth without the continents.

An ellipsoid is a mathematical model of the earth in the form of a sphere that is flattened at the poles and bulges at the equator. This is of a regular shape that

corresponds to the mathematical surface of the earth. All horizontal control surveys are reduced (by means of the ellipsoidal heights) and computed on this surface. Knowing these facts, you can imagine that the two surfaces will never coincide, they can only intersect at some points.

We can say that the old triangulation network and in fact, all old surveys of the world are flawed. In effect, these flaws were carried by all types of surveys connected to it. All surveys (including the cadastral survey that established the Bureau of Lands Location Monuments [BLLMS]) executed before PRS92 are tied to this triangulation network.

The Birth of PRS92

It was in 1989, during the National Resources Management and Development Project (NRMDP), when the effect of the geoid-spheroid separation was quantified. Initially, the NRMDP was geared towards the following objectives:

1. To provide support to other Project components by establishing 1st-order control points
2. To provide limited densification of the 2nd- and 3rd-order control points
3. To determine the relationship between the Luzon Datum and WGS84.

During the Project, 47 triangulation stations of the Luzon Datum were recovered and re-observed using GPS. Significant errors were found in the coordinates of the triangulation stations. This was expected knowing that the triangulation network was established with the assumption of a zero geoid-spheroid separation. Then, re-computation and re-adjustment of the coordinates of the triangulation stations had to be performed because of some typographical errors found in the old datasets. The recomputed geodetic network was later called the PRS92.

Can PRS92 be used in relocating lot corners?

Yes. But first, the transformation parameters for the cadastral datasets have to be determined. The inconsistencies of the old surveys have to be resolved. PRS92 is here to resolve all the inconsistencies of the old system. However, PRS92 cannot be used to relocate old lot corners until such time that all cadastral datasets have been integrated into the system. This is the role of the Data Integration Component of the PRS92 Project. Its aim is to transform all cadastral, ENR, and topographic base maps of the country into PRS92. After all the integration, we will have a homogeneous set of cadastral, ENR, and topographic base maps that can be compiled into a homogeneous **National Spatial Data Infrastructure (NSDI)**.

2 MOUs and 4 MOAs signed for PageNET Project

by Jennie C. Delos Reyes and Xenia R. Andres
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MOU signing of NAMRIA with PAGASA and PHIVOLCS: (seated from left) PHIVOLCS Director Renato U. Solidum Jr.; NAMRIA Administrator, USec. Diony A. Ventura; and PAGASA Director Prisco D. Nilo. Also present were (standing from left) PHIVOLCS Associate Scientist Dr. Teresito C. Bacolcol; Mapping and Geodesy Department (MGD) Officer-in-Charge (OIC)-Assistant Director Randolph S. Vicente; OIC-Deputy Administrators (DAs) Linda S.D. Papa and Efren P. Carandang; Financial Management Division OIC Roberto F. Almuete; Plans and Operations Division OIC Ruel M. Belen; and MGD Director Jose Galo P. Isada Jr. (all from NAMRIA); and PAGASA DA for Operations and Services Nathaniel A. Cruz.

Two MOUs (Memoranda of Understanding) and four Memoranda of Agreement (MOAs) to establish a cooperative agreement for the implementation and utilization of the PRS92-Active Geodetic Network (PageNET) Project were signed by NAMRIA. The two MOUs were with the Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA) and the Philippine Institute of Volcanology and Seismology (PHIVOLCS) while the four MOAs were with Legazpi City, the Philippine Navy (PN), the Nueva Vizcaya State University (NVSU), and Tacloban City.

Administrator Ventura signed on 13 February 2009 the two MOUs with PAGASA Director Prisco D. Nilo and PHIVOLCS Director Renato U. Solidum Jr., in the NAMRIA head office in Fort Bonifacio, Taguig City. The agreements aim to harness the full potentials and uses of the PageNET in the performance of the respective functions of the three agencies. Specifically, the undertakings with PAGASA and PHIVOLCS plan to explore the potential applications and benefits of the PageNET in view of PAGASA's vision to attain excellence in meteorology and support PHIVOLCS in earthquake and volcanic eruption predictions.

PAGASA and PHIVOLCS are both into multihazard mapping. Under the MOU, NAMRIA and PAGASA will cooperate in the exchange of technical and scientific data generated through the PageNET Project and in exploring its potentials in enhancing the weather forecast system of the country. NAMRIA shall supply PAGASA with technical data including topographic maps of the proposed sites of the Active Geodetic Station (AGS), a major element of PageNET, as well as other relevant information related to the



MOU with the Philippine Navy (PN): Administrator Ventura signs an MOU with PN Flag Officer in Command Vice Admiral Ferdinand S. Golez.

continued on next page ...