



IHO Capacity Building Programme

TECHNICAL VISIT REPORT

The State of Hydrography and Nautical Charting in Costa Rica



National Geographic Institute

Maritime and Ports Division

National University

National Metrological Institute

iMares (Rivers and Estuaries Maritime Engineering Unit)

University of Costa Rica



20-23 August 2024

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ABBREVIATIONS

AtoN	Aids to Navigation
CBSC	IHO Capacity Building Sub-Committee
DGPS	Differential Global Positioning System
ECDIS	Electronic Chart Display and Information System
EEZ	Exclusive Economic Zone
ENC	Electronic Navigational Chart
FIG	Fédération Internationale des Géomètres (International Federation of Surveyors)
GIS	Geographic Information System
GMDSS	Global Maritime Distress and Safety System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HSSC	IHO Hydrographic Services and Standards Committee
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IBSC	International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers
ICA	International Cartographic Association
IHO	International Hydrographic Organization
IOC	Intergovernmental Oceanographic Commission
IMO	International Maritime Organization
IMSAS	IMO Member State Audit Scheme
INT	International
IRRC	IHO Inter-Regional Coordination Committee
LORAN	Long Range Navigation System
MS	Member State
MSDI	Maritime Spatial Data Infrastructure
MSI	Maritime Safety Information
NC	Nautical Charts
NHS	National Hydrographic Service
NHC	National Hydrographic Committee
NHCC	National Hydrographic Coordination Committee
NtMs	Notice to Mariners
PCA	Primary Charting Authority
RENC	Regional ENC Coordinating Centre
RHC	Regional Hydrographic Commission
RNC	Raster Navigational Chart
SOLAS	[United Nations] Convention for the Safety of Life at Sea
TTW	Territorial Waters
UN	United Nations
UNCLOS	United Nations Convention on Law of the Sea
WMO	World Meteorological Organization
UNGGIM	United Nations Global Geospatial Information Management
WWNWS	World Wide Navigation Warning Service

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EXECUTIVE SUMMARY

During the MACHC22 meeting in 2021, the need for a visit was discussed at the Capacity Building Committee. In their national report and presentation, it was highlighted that there is currently no National Hydrographic Committee (NHC) responsible for national hydrographic management, and that there are limited resources available for effective hydrographic management. It was suggested that a technical visit would help to identify the gaps and make recommendations for the way forward. Additionally, a visit could help to emphasize the national importance of hydrography and provide support for discussions with government ministers. Since the last visit took place in 2011, it was agreed that a new visit is needed.

This application was approved by the MACHC which understood that a visit of this nature would contribute to motivate national authorities to increase investment in the field of hydrography and therefore, the necessary coordination was arranged to implement the agreement. The Chair of The MACHC agreed with the Steering Committee of the International Hydrographic Bureau (IHB), secretariat of the International Hydrographic Organization (IHO) that the visit would be carried out by Andy Dippolito of the United States National Geospatial Intelligence Agency (US/NGA) Chair of the MACHC MSDI WG and Catiria Bushnell (US/NGA).

During the most recent visit, the team was able to meet with stakeholders and representatives from various governmental agencies involved in managing the maritime and riverine environment of Costa Rica. Meeting with the Directors of these agencies allowed the technical team to explain the significance of establishing a National Hydrographic Committee (NHC) and the advantages of joining the International Hydrographic Organization (IHO). They also stressed the importance of training and education in hydrography to enhance Costa Rica's capabilities and to create opportunities for strengthening the country's economy.

It was evident that there was an urgent need to enhance communication among the stakeholders by setting up a National Hydrographic Committee (NHC) at the earliest opportunity. The necessity of an NHC was communicated to all stakeholders, but it might be challenging due to the presence of multiple national authorities with potential overlapping responsibilities.

It was clear that MOPT is responsible for MSI information and post that to their website, but that information is not sent to NAVAREA Coordinator (4 and 12).

Several recommendations were made during the visit and are provided in this report.

TECHNICAL VISITS September 5 th – 7 th 2011	First contact between CAPT Jamie McMichael-Phillips (UKHO) and M Alberto Costa Neves (IHO: Assistant Director in charge of Capacity Building).
Feb 2024	Andy Dippolito connected with Miguel Alejandro Artavia Perez to complete Procedure 9B and coordinate TV
August 2024	Travel to Costa Rica for Technical Visit per request at MACHH22 2021 under the responsibility of MACHC (TV led by the USA/NGA), resources from USA/NGA).

August 20 th 2024	Working meeting with National Geographic Institute and Maritime and Ports Division (MOPT) Working meeting with MOPT
August 21 th 2024	Working meeting with National University, National Meteorological Institute and Maritime and Ports Division (MOPT)
August 22 th 2024	Working meeting with iMares(Rivers and Estuaries Maritime Engineering Unit), University of Costa Rica and Maritime and Ports Division (MOPT)

Terms of Reference for this Technical Visit can be seen at Annex A.

GENERAL AWARENESS IN COSTA RICA

Costa Rica is a member of the IMO since 1981.

Costa Rica is not a member of IALA.

Costa Rica is not a member of the IHO.

A comprehensive understanding of SOLAS obligations and the significance of hydrography is prevalent across various Costa Rican organizations.

Currently, there are ongoing discussions regarding the establishment of a National Hydrographic Committee (NHC), as recommended by the 2011 Technical Visit (TV). All stakeholders are cognizant of this recommendation; however, progress has been hindered by a lack of coordination. Notably, the absence of interest from the National Government threatens to impede any advancements in this regard. Before the TV, there was reluctance to initiate the formation of an NHC without the acquisition of relevant hydrographic equipment. The TV underscored the urgency for all stakeholders to expedite the establishment of the NHC.

While an awareness of Costa Rica's SOLAS obligations exists, limited resources pose challenges in fulfilling these commitments. Costa Rica's Maritime Safety Information (MSI) capabilities and their inability to broadcast further substantiate the need for external support.

The stakeholders are cognizant of the fact that the US National Geospatial Intelligence Agency (NGA) serves as the Primary Charting Authority on behalf of Costa Rica. Currently, there is no formal agreement in place for this responsibility. It is imperative for Coastal States to ensure that their PCA is kept apprised of any information pertaining to Safety of Life at Sea (SOLAS). Therefore, this matter was also discussed during the recent meeting.

CERTIFIED PERSONNEL

From discussions it was determined that there are no certified personnel in the following fields:

- MSI specialists
- Hydrographic surveyors
- Marine cartographers

- Marine GIS experts (*QGIS is used*)

HYDROGRAPHIC SURVEY & NAUTICAL CARTOGRAPHY CAPABILITY

MOPT and iMARES both conduct localized surveys as per the requests of customers and the requirements of various organizations. Currently, there is no formal agreement in place to share the data with PCA, but the organizations have expressed their willingness to do so. NGA and UKHO are both responsible for producing Charts of ports, and no charts are produced locally.

MSI RESPONSIBILITY

MOPT post NtM to their website, recently updated contact information was shared with NAVAREA Coordinator, during TV it was discussed and information needed to be updated with new POC.

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REPORT OF TECHNICAL VISIT TO Costa Rica

20-23 August 2024

Reference(s):

- A. [IHO Publication M-2 *The Need of National Hydrographic Services* - Version 3.0.7]
- B. [IHO CB Procedure 9: *Guidelines to Conduct Technical Visits*]
- C. [IHO CB previous Technical Visit Report]
- D. [National Report from coastal State to last RHC meeting]

Introduction

In 2011 an IHO TV was conducted by the UK Hydrographic Office (UKHO) and Secretary of the IHO Sub-Committee on Capacity Building. The TV raised a number of recommendations to assist Costa Rica in developing its capabilities.

This aim of this TV was to revisit those recommendations and to establish to what extent they have been addressed, focusing on MSI capabilities. The visit also aimed to identify where assistance can be provided to help Costa Rica in its hydrographic capability development.

1. Background

The MACHC CB coordinator (MACHC CBC) reminded the MACHC24 in Paramaribo, Suriname in 2023 that a request had been made from Costa Rica at MACHC22 for a Technical Visit in 2022. Due to funding and travel restrictions travel was pushed to 2024. Following a discussion between Lucy Fieldhouse (MACHC CBC) and Andy Dippolito US/NGA (as PCA to Costa Rica) it was agreed that US/NGA would fulfill this in 2024.

2. Composition of the Team

Note that the RHC Technical Visit Team is comprised by:

Name	Role
Mr. Andy Dippolito, US/NGA, Branch Chief ENC Production (West)	Team Leader
Ms. Catiria Bushnell, US/NGA, Cartographer	Assistant

Administrative and Logistic information on accommodation, flight timetable/schedule, transportation including meeting arrangements and timetabling of the TV, were coordinated by NGA and MOPT.

PART A - OVERALL ASSESSMENT OF THE SITUATION IN REGION

3. Efficacy of the Technical Visit.

The technical visit underscored the implementation of many recommendations from the previous visit. Stakeholders demonstrated a clear understanding of the necessity of NHC and the significance of the RHC. Throughout the visit, it became evident that communication between various organizations was lacking. The IGN emphasized that progress would be impeded without interest and support from national government leaders. Overall, the visit proved to be a valuable investment as it shed light on the activities of different organizations and unveiled potential opportunities for future collaboration.

4. Cooperative Arrangements and Potential.

Currently there are no Cooperative Arrangements.

PART B – COSTA RICA ASSESSMENT

5. RHC Involvement.

Costa Rica is not a full member state of the IHO, within the MACHC they are an Associate member, they did not attend the MACHC24 in Paramaribo, Suriname 12-15 December 2023. The last MACHC that Costa Rica attend was MACHC22 (2021). At which time they present their National Report to the Plenary. A Technical Visit was conducted 5-7 September 2011. Both the IGN and MOPT have sent personal to RHC in the past, for future meeting it was unclear if both organizations would be represented again.

6. Preliminary Liaison.

The MOPT provided Miguel Alejandro Artavia Perez (Director Ports and Coast Engineering Department) as a point of contact who aided the Team with this TV. Through his assistance, the necessary stakeholders were contacted, and meetings arranged. Mr. Miguel Alejandro Artavia Perez introduced the Technical team at meetings and outlined the reason for the visit including the main objectives.

The assistance provided by the MOPT contributed directly to the success of the visit and much effort was put into arranging unscheduled meetings with newly identified stakeholders.

7. Points of Contact.

For IGN Mr. Marvin Martín Chaverri Sandoval and for MOPT Mr. Miguel Alejandro Artavia Perez confirmed that the details in the IHO publication P-5 were correct and didn't require any updating.

The organizational levels of Costa Rica could not be determined as each Organization falls under different ministries with no National Hierarchy.

DESCRIPTION OF MARITIME ACTIVITIES

8. National Maritime Affairs.

It is widely acknowledged among stakeholders that the absence of a NHC in Costa Rica has impeded the country's maritime development. The efforts undertaken by SINAMOT in the realm of Tsunami Warning alerts have been commendable. Collaborating with other organizations, SINAMOT has successfully developed a Warning App that is accessible on both iOS and Android platforms. This application facilitates the dissemination of alerts to all users within an affected area, providing essential information on evacuation routes and safe areas. Consequently, it aids individuals in ascertaining secure locations and areas to avoid.

During the facility tour, iMARES presented a comprehensive overview of their research activities. The team showcased a wave generator capable of accurately replicating wave characteristics, including power and constancy, and demonstrated its impact on underwater breakwaters. Additionally, they exhibited a scaled replica of the port of Caldera, highlighting the effects of erosion on a major route. Notably, the team conducted a live demonstration showing the adverse impact of waves on the infrastructure, resulting in road erosion. Furthermore, the large wave pool illustrated various breakwater configurations and their response to wave dynamics. This research assumes significance due to the deteriorating condition of an aging historical breakwater. Leveraging this model, researchers can

efficiently assess different underwater breakwater designs to mitigate wave energy without disrupting the natural wave patterns.

While visiting with UNA SINAMOT the TV Team learned about the Tsunami Warning network that Costa Rica is apart of. SINAMOT with the Help of University of Hawaii have Tide Gauges at different locations with 4 more coming in the future. All the tidal information is then sent to both UCR and Institute of Meteorology (which published the tide tables).

9. Trade and Maritime Traffic.

- a. Tourism Cruise Liners. (major Cruise terminals)
 - Puerto Limon
 - Puerto Caldera

10. Responsibility for Safety of Navigation.

- a. MOPT is responsible for the surveying and dredging of major ports, with surveys being conducted every 6 months and dredging taking place every 3-5 years as need. Notice to Mariners are promulgated via the MOPT website.

11. Defense Force Responsibilities.

- a. Costa Rica has no national defense; the Costa Rican Civil Guard is and fall under the Ministry of Public Security. Currently the have 1 Large patrol boat, 5 small patrol boats and 1 rescue Tug on the Caribbean coast and 3 small patrol launches on the Pacific Coast

12. Coastal Zone Management and Environmental Protection.

- a. None noted.

OUTLINE C 55 ANALYSIS

13. Status of surveys within the National Maritime Zone.

No updates are made to C-55, with limited surveys shared internally via UCR and MOPT, some ports are surveyed every 6 months.

14. Collection and Circulation of Nautical Information.

Collection of Nautical Information is done for research and local dredging operations.

15. Survey Capability.

- a. The marine survey capabilities of MOPT are restricted to a single beam and are limited to three ports. This limited capacity necessitates the solicitation of support from the Costa Rican Civil Guard. In instances where such support is unavailable, MOPT is compelled to engage the services of a private boat for surveying purposes.

16. Independent Chart Production Capability.

- a. No charts are produced independently. IGN noted that they recognize the US/NGA as a

PCA, but no formal agreement is in place.

PROPOSALS FOR COORDINATION AND CAPABILITY BUILDING

17. National Hydrographic Committee.

- a. The absence of a National Hydrographic Committee has been deliberated with various organizations, and consensus has been reached regarding its necessity. Despite unanimous agreement, the lack of support from higher levels of government has hindered substantive progress, resulting in discussions being the extent of the undertaken measures. In light of this, it has been proposed that the International Hydrographic Organization (IHO) arranges a high-level visit to underscore the imperative need for the establishment of a National Hydrographic Committee.

18. Phase 1 Hydrographic Capability: MSI Organization and GMDSS.

Summarize any proposals for improvement of liaison and effective passage of information between national and regional charting agencies. Comment on the requirement for liaison with Transport Ministries or Port Authorities.

- a. MSI (Navigational Warnings).
Notice to Mariners are published on local website but not pushed out to NAVAREA coordinator.
- b. Information on Ports and Harbors.
Local information is made available and easy to access via World Wide Web.
- c. GMDSS Status.
Summarize the status of GMDSS in local waters, and any advice offered to local authorities (Table 1).

Table 1: Status of GMDSS in local waters.

Master Plan	A1 Area	A2 Area	A3 Area	NAVTEX	SafetyNET	Notes
No	No	No	No	No	No	1 to 8

Notes:

1. Specify any geographic limitations to Area coverage. - None
2. Note NAVTEX Station location, especially when designed for optimum overlap. - None
3. Note where proposals are subject to financial appraisal by the national government. – No proposals
4. Note where choice of MSI medium is to be subjected to cost analysis, and comment on optimum solution and interim arrangements. – n/a
5. Note Team recommendations of negotiation for facility sharing. – Recommended sharing the data with NAVAREA Coordinators.
6. Specify any firm commitments or local proposals for coordination. - None

7. Note where SafetyNET is available and could be used for Coastal Warnings but the State wishes to assess comparative costs of implementing their own NAVTEX Station before adopting this solution. - None

8. Note where the Team could not establish status of National Plan. - No National Plan in place and lack of understanding of the need for one.

d. Other Services.

Note any other information useful in national and adjacent waters. - none

19. Phase 2 Hydrographic Capability: Survey.

Comment on the adequacy of top-level support and resourcing for the local hydrographic service/unit. Summarize any proposals which the Team has made for revision of line accountability of the unit. Where there is no local hydrographic unit, comment on the requirement for independent capability.

a. Provision of Survey Data.

a. MOPT and UCR were both willing to share Survey data with unofficial PCA, the passing of this information will need to be coordinated and structured by all parties for use in updating the effective areas, currently ENC of these ports are maintained by UKHO and NGA.

b. Survey Capability.

a. MOPT has a single beam Capability, but lacks a survey boat. They are forced to rely on other organizations to use vessels to conduct surveys. Once surveys are conducted they are processed and used to internally.

c. Potential for Regional Activity.

a. Recommended engagement at RHC and with other Central and South American Countries.

20. Phase 3 Hydrographic Capability: Chart Production.

a. At present, Costa Rica lacks the capability to produce hydrographic charts and rely on NGA and UKHO for creating charts for selected ports. There is a need for CAT-B training and potential investment in production software. It is recommended to engage in discussions with the national government to explore the possibility of joining the IHO as members, thereby gaining access to training courses offered to member states.

21. Summary of the Assessment of the National Hydrographic Capability

Table 2 summarizes the assessment of the national hydrographic capability.

Table 2: Assessment of National Hydrographic Capability.

IHO Member	RHC	NHC	Phase 1 Capacity	Phase 2 Capacity	Phase 3 Capacity	Notes
No	Associate Member	No	Partial	Partial	No	1 to 6

Notes:

1. Inform how the Maritime and Port organizations in the country relate with the national

- hydrographic authority and or the charting authority. – No NHC for the Maritime and Port organizations to relate to.
2. Inform whether the Maritime and Port organizations have some survey equipment, and some surveyors trained to IHO standards. – MOPT has single beam survey equipment but no platform for it, and none of the surveyors are trained to IHO standards.
 3. Note whether it may be possible to generate/regenerate limited field survey capability. MOPT and UCR have the ability to generate limited field survey.
 4. Note any charts which are produced, together with limitations e.g. suitable for government planning, but not for navigation, particularly in view of lack of correction arrangements. – No charts are produced.
 5. Note where RHC advice on equipment management and maintenance is merited. -N/A
 6. Note any assessment of potential to provide field survey services to other States in the region and recommend scope for RHC consultative support. – N/A

PROPOSALS FOR ASSISTANCE

22. Training

- a. The TV Team recommended MSI training when available as well as discussed, the need for CAT-A and CAT-B training, while this training is needed until Costa Rica becomes an IHO Member state the long-term training is not available to them through the IHO.

23. Equipment.

- a. The TV Team recommended a dedicated vessel to conduct surveys, but with the limited National Government interest additional equipment is out of reach.

24. Funding.

- a. Funding is an issue for Costa Rica. Most of the Organizations visited had a set budget that was barely sufficient to fulfil their current activity.
- b. Provided M-2 to IGN.

FOLLOW-UP ACTIONS

25. Encouragement of Formation of an NHC, Development of a National Hydrographic Strategy, and RHC Membership.

- a. The TV team recommends the creation of an NHC with equal representation from various organizations. Many organizations are concerned about the lack of communication within the nation. It is suggested to have a high-level visit from the IHO to emphasize the importance of the NHC and to encourage becoming a member state of the IHO. Additionally, it is recommended to actively participate in the RHC. Recommend contacting: Director of IGN, Director of MOPT and President of Costa Rica

Action: **IHO Secretariat and RHC Chair.**

26. Encouragement of Effective and Timely Collection and Promulgation of Hydrographic Information.

- a. Recommend that MSI information is promogulated to NAVAREA Coordinator, in addition rather than having one person as POC for MSI, have a group email box that goes to all members of the team, to reduce the need to update contact list.
- b. Action: **Technical Visit Team.**
- c. Note any requirement for MSI/SAR liaison with local authorities. Action: **NAVAREA Coordinator.**

27. Encouragement of Development of Hydrographic Capability.

Note areas where the Hydrographic Unit merits assistance:

- a. Recommend joining IHO to have the availability to attend IHO Training to develop the Hydrographic capability.
- b. Recommend a vessel be acquired to conduct hydrographic surveys from.

CONCLUSIONS

28. Cooperative Opportunities.

- a. Recommend that the RHC Chair and IHO Secretariat reach out to conduct a High-Level Visit to discuss the forming of an NHC. During the visit the TV team discussed at all of the meetings the need for an NHC, but we told that unless there is national interest then there would be limited movement on this. The TV team also highlighted the up coming MACHC meeting 2-6 December 2024 in Panama, and encouraged participation at this meeting.

29. National Hydrographic Committees (NHCs).

- a. No NHC has been formed. This was recommended at the last TV and was noted at Previous MACHC meetings.
- b. The establishment of an NHC in Costa Rica is essential to ensure the long-term improvement of MSI within Costa Rica.
- c. Once created correct focus and management, the NHC would be well placed to identify solutions to issues raised as well as prioritizing requirements to meet all stakeholders' requests. This will prevent duplication of effort and hopefully ensure that the MSI coordinator is aware of all relevant information.
- d. The initial meeting should involve senior management from each organization to ensure terms and conditions and roles and responsibilities are agreed. The meetings would be chaired by a stakeholder and the initial meeting would be followed by meetings between more technically minded staff.

Recommendations

30. Urgent Actions.

- a. Ensure all relevant data is passed to the MSI coordinator in a timely manner.
- b. MSI coordinator to ensure regular contact (minimum of once every three months) is maintained between them, the PCA and the NAVAREA coordinator.

- c. The MACHC CBC should propose a regional MSI course to include Costa Rica.
- d. Requirement to establish the NHC as defined by the 2017 TV.
- e. Set the terms of reference for the NHC to include all stakeholder requirements
- f. Formalize the roles and responsibilities of those involved in the NHC focusing on the needs of SOLAS and ensuring the reduction in duplicating effort.
- g. Encourage data sharing between stakeholders.
- h. The NHC to get access to the survey data so that all stakeholders are given access and any relevant information is passed to the PCA.
- i. Formalize PCA agreement.
- j. Consider the implementation of a data storage system that allows access by all relevant stakeholders so that data can be collected once and used many times for the benefit of Costa Rica.
- k. Costa Rica should become a full member of the IHO.
- l. Attendance at annual RHC.

31. RHC Follow up Actions


- a. Encouragement of forming an NHC.
- b. Work with Regional HO's to discuss regional initiatives.
- c. Attend a Regional MSI Course

32. Follow up Opportunities.

- a. Recommend attending MACHC25 2-6 December 2024 in Panama

33. Preparations for Next RHC Conference.

- a. Last Technical Visit Assessment
- b. Technical Visit Recommended Actions

DATE	16 September 2024
RHC Technical Visit Team Leader	Mr. Andy Dippolito
SIGNATURE	

Annex List:

- A. Terms of Reference of the RHC Technical Visit Team.
- B. Summary of Events
- C. Preliminary Agenda
- D. List of Contacts
- E. TECHNICAL VISIT PHOTOGRAPHS
- F. P-5 IHO Yearbook Template update
- G. NHS Organization Template
- H. Hydrographic Surveys Coverage
- I. PCA Chart and ENC Coverage
- J. Coastal State report to last RHC meeting
- K. Update on 2011 TV Recommendations

DISTRIBUTION: Chair RHC

INFORMATION: IHO Secretariat / Costa Rica

1. The Technical Visit Team, comprising members of the staff from United States of America's National Geospatial Intelligence Agency (NGA), led by Andy Dippolito, are to discuss issues of mutual interest in the fields of hydrography and maritime safety information (MSI).

Preparation

2. The members of the Team, under the guidance of the leader and with the assistance of the staffs of the Hydrographers of Costa Rica, are to plan the Team visit having obtained access to material available from each organization, the International Hydrographic Organization Secretariat and the information supplied by Costa Rica.

Work Objectives

Note: If the Technical Visit Team has more than one area of activity e.g. MSI and hydrography, separate headings should be used. The following example covers hydrographic work.

3. The Team is to:
 - a. obtain access to decision making levels of government in each country visited and liaise with senior officials, emphasizing the importance of hydrography to coastal States and, hence, the need to include hydrographic and associated charting activities within National Plans;
 - b. assess the National capacities to plan and execute the collection and rendering of hydrographic data to enable the production of charts and publications both locally and through the supply of data to Hydrographic Offices with international chart folios;
 - c. consider and advise on measures which can be taken to improve the capacity of nations to carry out the above;
 - d. emphasize the basic importance of a national system for the collection of data, such as engineering drawings and local Notices to Mariners, which have an effect on the interests of mariners;
 - e. advise on the assistance to be gained from close liaison with the IHO Secretariat, IMO and funding agencies to enable viable and sustainable capability to be maintained.

Report

4. A Report on the activities and recommendations of the Team is to be submitted to the Chair of the RHC (Regional Hydrographic Commission).

<u>Date</u>	<u>Event</u>
<i>19 August 2024</i>	RHC Technical Visit Team convened for planning meeting at Hotel
<i>20 August 2024</i>	Team arrived at IGN office
<i>20 August 2024</i>	Meeting at IGN with Director and MOPT with government to discuss the need for NHC and interagency communication.
<i>20 August 2024</i>	Team arrived at MOPT office
<i>20 August 2024</i>	Meeting at MOPT with Director to discuss the need for NHC current projects and the need to share MSI data with NAVAREA Coordinator.
<i>21 August 2024</i>	Team arrived at UNA – SINAMOT office
<i>21 August 2024</i>	Meeting at SINAMOT to discuss the Tsunami warnings and the Mobile app that was developed to warn people in Tsunami areas within the country.
<i>21 August 2024</i>	Team arrived at IMN Office
<i>21 August 2024</i>	Meeting at IMN to discuss the need for NHC, as well as discussed how the tide tables are updated and published to website.
<i>22 August 2024</i>	Team arrived at UCR
<i>22 August 2024</i>	Meeting at iMARES to discuss the research that the University has been conducting as well as a tour of their facility where they displayed multiple wave generator models.
<i>23 August 2024</i>	RHC Technical Visit Team departed Hotel to Airport for return trip.

Time plan			
Time	20 Tuesday August	21 Wednesday August	22 Thursday August
07:00			
08:00			
09:30	✓		
10:00	✓	✓	✓
11:30	✓	✓	✓
12:00			
13:30		✓	
15:00		✓	
16:00			

National Geographic Institute and Maritime and Ports Division, MOPT
(CONFIRMED)

National University and Maritime and Ports Division, MOPT
(CONFIRMED)

iMares (Rivers and Estuaries Maritime Engineering Unit), University of Costa Rica and Maritime and Ports Division, MOPT
(CONFIRMED)

National Meteorological Institute and Maritime and Ports Division, MOPT
(CONFIRMED)

LIST OF CONTACTS

ANNEX D

Tuesday 20 Aug 2024

Organization	Name	Title	Contact number	Email address
MOPT	Alejandro Artavia Pérez	Jefe Departamento Inspección Puntos de Control	+506 88105518	alejandro.artavia@mopt.go.cr
MOPT	Diego Leal Orend	PHT	+506 88955945	diego.leal@mopt.go.cr
IGN-RN	Leonardo Sobal M	Coordinador Subproceso Cartográfico	+506 22020986	lsobal@rnp.go.cr
MOPT	Fabian Méndez Gamero	Director DSN	+506 98311504	Fabian.mendez@mopt.go.cr
MOPT	Luis Villalobos Pacheco	Investigador en Ing. Marítimo - Dirección M.P.	+506 88283482	luis.villalobos@mopt.go.cr
MOPT-DNS	Caroli Villalta Fernández	En cargo de Proceso Señalamiento	+506 88920679	carol.villalta@mopt.go.cr
IGN	Marvin Chaverri Sandoval	Subdirector del IGN	+506-88811015	mchaverri@rnp.go.cr
IGN	Angelico Delgado Artavia	Asesor Legal IGN	(506) 83125110	adelgado@rnp.go.cr
IGN-AN	Heutal Aguilar Varela	Directora a.i.	(506) 2202-0601 8318-0670	mguilarte@rnp.go.cr
IGN	Christian Núñez S.	Jefe	(506) 8667 3109	cnunez@rnp.go.cr

Wednesday 21 Aug 2024

Organization	Name	Title	Contact number	Email address
Sinamot-UNA	Kristel Espinoza	Researcher	+506 83827227	kristel.espinosa@una.ac.cr
IMN	Martín Pereira Malpica	Head Data Network	+506 88201990	mpereira@imn.ac.cr
IMN	Mauricio Rodolfo Ortiz Moya	Meteorólogo	+506 8816-3977	martiz@imn.ac.cr

LIST OF CONTACTS

ANNEX D

Thursday 22 Aug 2024

Organization	Name	Title	Contact number	Email address
imares-UCR	George Gonzalez	investigador	(506) 8392 3023	george.gonzalez@ucr.ac.cr
IMARES-UCR	Henry Alfaro C.	investigador	+506 8873-5645	henry.alfaro@ucr.ac.cr

TECHNICAL VISIT PHOTOGRAPHS

ANNEX E



Image 1 Meeting with IGN, MOPT and IHO TV Team

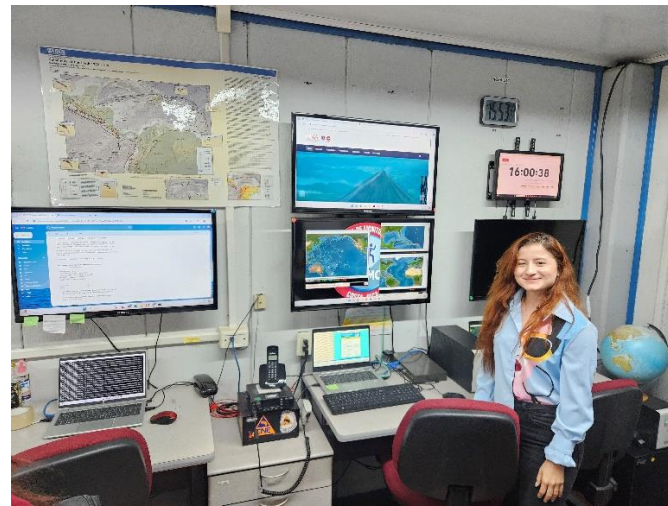


Image 2 Kristel from SINAMOT



Image 3 IMN, MOPT, and IHO TV Team



Image 4 Meeting with iMARES, MOPT and IHO TV Team



Image 5 Model at UCR which iMARES uses to conduct study of waves on breakwaters

Costa Rica / *Costa Rica*

INSTITUTO GEOGRAFICO NACIONAL (IGN)

Contact information / Informations de contact / Información de contacto

National Hydrographer or equivalent -Hydrographe national ou équivalent -Hidrógrafo Nacional o equivalente	Director Ms Marta E. Aguilar Varela Tel: +506 2202 0675/+ 506 2202 0601/+506 2202 0667 E-mail: maguilarv@rnp.go.cr Agency address: Instituto Geográfico Nacional de Costa Rica, San José, 523-2010, Costa Rica
Other point(s) of contact -Autre(s) point(s) de contact -Otros punto(s) de contacto	Mr Marvin CHAVERRI SANDOVAL Tel: + 506 2202 0601 E-mail: mchaverri@rnp.go.cr

Agency information / Information sur l'agence / Información sobre la agencia

Date of establishment -Date de mise en place -Fecha de constitución	1 July 1944
Principal functions of the organization or the department -Attribution principales de l'organisme ou du département -Principales funciones de la Organización o el departamento	Cartographic work.

Last updated : March 2020

Dernière mise à jour : mars 2020

última actualización marzo 2020

MINISTRY OF PUBLIC WORKS AND TRANSPORTS (MOPT)

Contact information / Informations de contact / Información de contacto

Head of the Hydrographic Office (if different from the person indicated above) -Directeur du service hydrographique (si différent de la personne indiquée ci-dessus) -Jefe del Servicio Hidrográfico (si es diferente de la persona indicada anteriormente)	Director Mr Miguel Alejandro ARTAVIA PEREZ (Ports and Coast Engineering Department, Head) Special postal address: Direction of Maritime and Port Works, Maritime and Ports Division Tel: +506 2523 2580 E-mail: martavip@mopt.go.cr
Other point(s) of contact -Autre(s) point(s) de contact -Otros punto(s) de contacto	(Hydrographic Unit of the Maritime and Ports Division)Mr Diego LEAL OBANDO E-mail: dlealoba@mopt.go.cr

Last updated : November 2019

Dernière mise à jour : novembre 2019

última actualización noviembre 2019

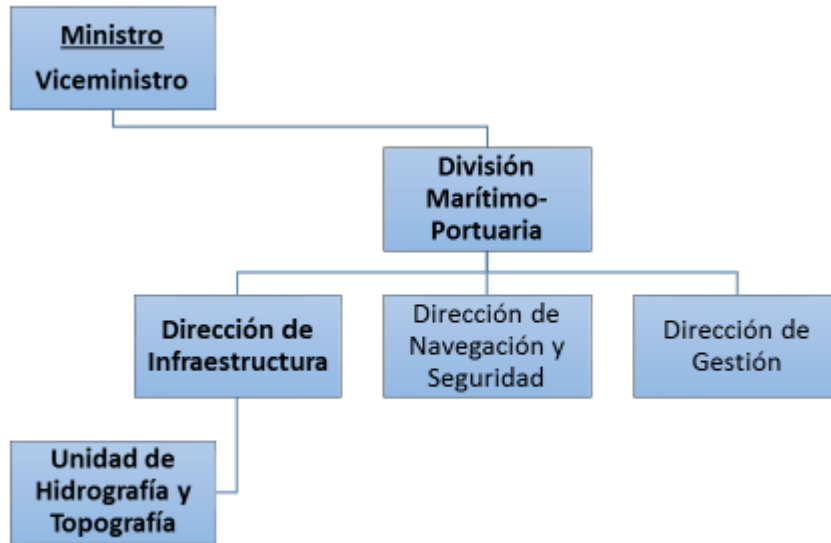


Figura 1: Organigrama del MOPT



1 IGN ORG Chart



GOBIERNO
DE COSTA RICA

Hydrographic and nautical charting services

Land Surveying and Hydrography Team (LSHT-MPD-MOPT)



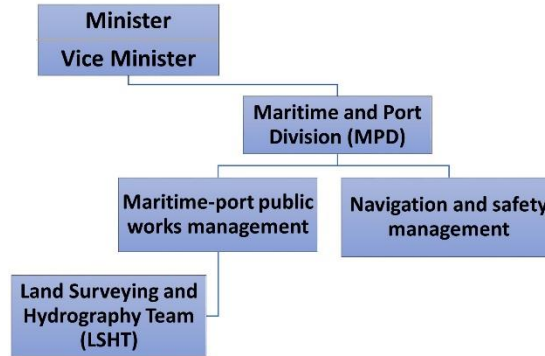
GOBIERNO
DE COSTA RICA

Contents:

1. Organization chart
2. Applicable legislation.
3. Land Surveying and Hydrography by LSHT-MPD-MOPT.
4. Nautical charts in Costa Rica.
5. Conclusions, recommendations and needs.



1. Organization chart: The LSHT in the Ministry of Public Works and Transport (MOPT)



2. Legislation

- **1971 → Changes in MOPT’s Creation Law (N°4786).**
 Article N° 2. MOPT’s objectives:
“Plan and produce geographic and hydrographic charts, including maps of the country. Study, research and work on geographic, hydrographic, geophysical and other aspects that complement these functions”.
- **2017 → Maritime and Port Division’s transformation (Executive decree N°40803-MOPT).**
 Article N° 10. MPD’s objectives:
“...Define field surveys to plot and control routes in navigation channels...”.
“...Schedule studies on the operating conditions of existing maritime-port works, as well as studies, the survey of bathymetric and topographic maps, landmarks or geographic reference points and benchmarks...”.
- **2020 → National Port Council (Executive decree N°42454-MOPT).**
 Coordination between institutions with port and maritime matters.

HYDROGRAPHIC SURVEYS COVERAGE

ANNEX H



GOBIERNO DE COSTA RICA

Land Surveying and Hydrography Team (LSHT-MOPT)

Staff:

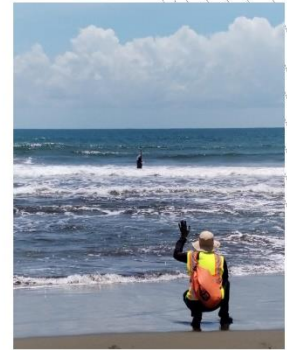
- Fernando Flores Ortiz
- Arllang Tebyanian Castro
- Diego Leal Obando

Support:

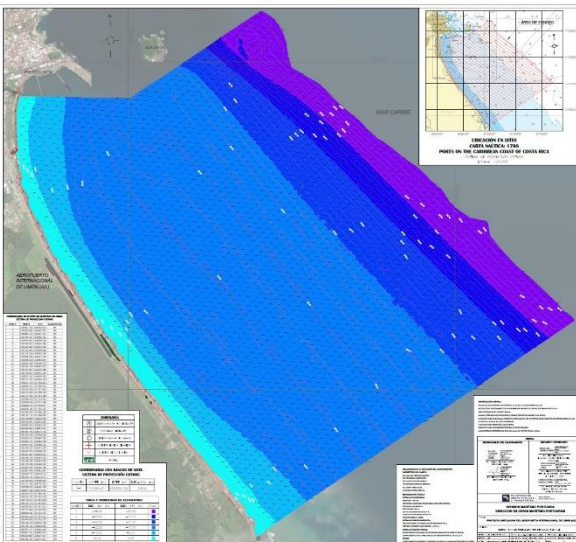
- Esnaider Rodríguez Serrano
- Andrey Pérez Rojas
- Miguel Reyes Carrillo

Equipment:

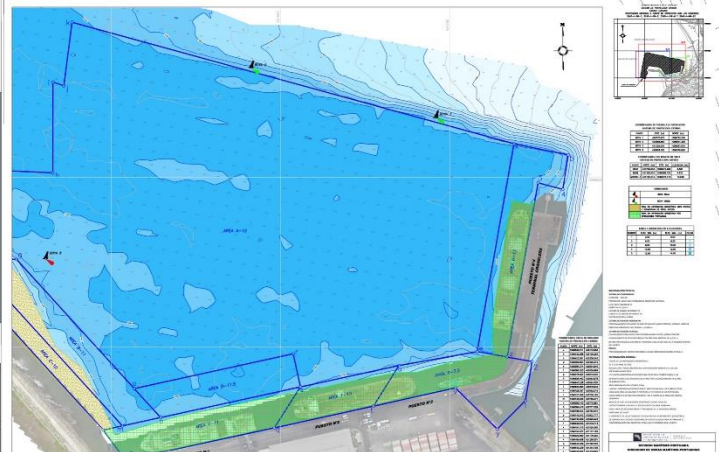
- Single beam echosounders
- GNSS receivers
- Hypack software
- SVP'S and pressure sensor's
- Drones
- Side scan sonar



Land Surveying and Hydrography by LSHT-MOPT

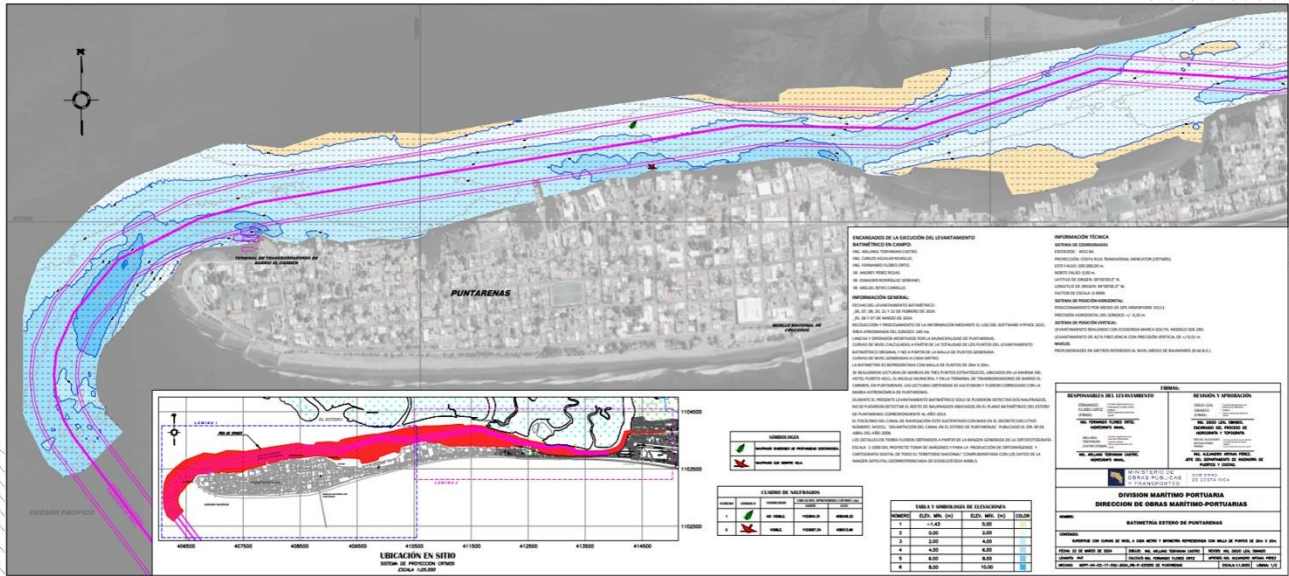


Limón International Airport (AIL)



Caldera Port

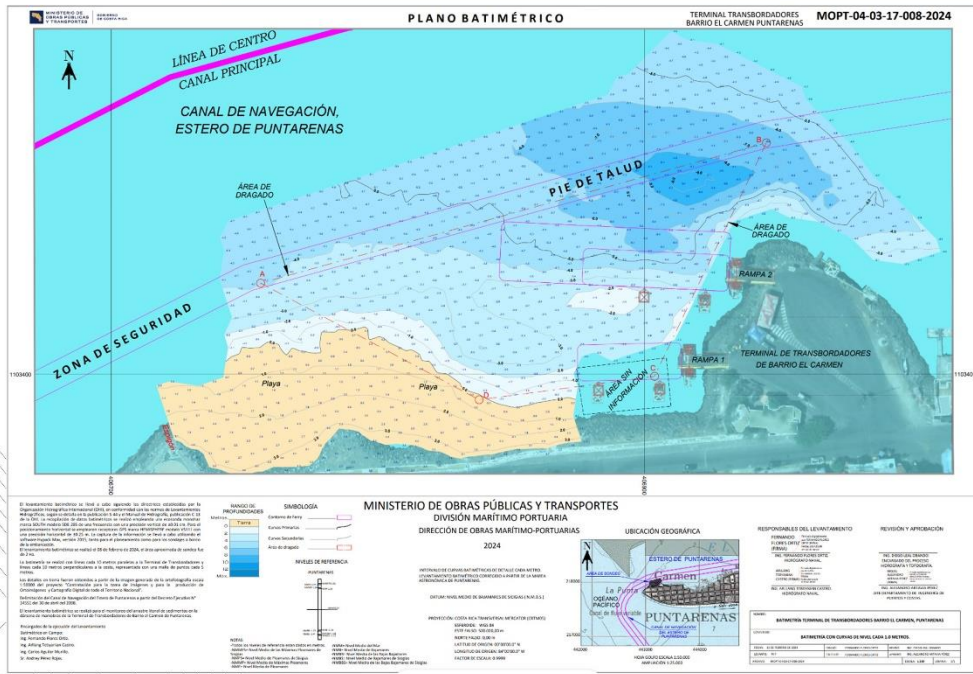
Land Surveying and Hydrography by LSHT-MOPT



Puntarenas Navigation Channel



Land Surveying and Hydrography by LSHT-MOPT



Puntarenas Ferry Terminal



HYDROGRAPHIC SURVEYS COVERAGE

ANNEX H



Surveys between 1975 and 1996 for nautical charts (season of work)

- Program participants:**
- 1. Naval Oceanographic Office of the United States Government:**
Provided technical direction and miscellaneous equipment.
 - 2. National Coast Guard Service, Ministry of Public Security:**
Survey boats in Golfito, Golfo Dulce in 1996.
 - 3. National Geographic Institute (IGN):**
Provided technical support of nautical cartography.
 - 4. Ministry of Public Works and Transportation (MOPT):**
Provided staff in survey execution and boats except in Golfo Dulce and Golfito.



Land Surveying and Hydrography by LSHT-MOPT



HYDROGRAPHIC SURVEYS COVERAGE

ANNEX H



SURVEY'S INFO

NICOYA'S GULF				
NUMBER	DESCRIPTION	EXECUTION YEAR	SCALE	COVERAGE (Km ²)
1	GOLFO DE NICOYA	1975	1:25.000	146.2
2	GOLFO DE NICOYA	1975	1:50.000	531.2
3	GOLFO DE NICOYA	1977	1:25.000	72.7
4	GOLFO DE NICOYA	1980	1:50.000	806.7
5	GOLFO DE NICOYA	1977 y 1980	1:10.000	47.3
6	GOLFO DE NICOYA	UNKNOWN	1:25.000	235.4
7	CALDERA	1983	1:5.000	18.7
8	ANTIGUO MUELLE DE PUNTARENAS	1983	1:1.000	0.2
9	BAHIA HERRADURA	1979-1980	1:5.000	8.3



SURVEY'S INFO

PUNTA JUDAS AND PUERTO QUEPOS				
NUMBER	DESCRIPTION	EXECUTION YEAR	SCALE	COVERAGE (Km ²)
1	PUNTA JUDAS A PUERTO QUEPOS	1986 - 1988	1:50.000	1538.3

QUEPOS PORT AND DOMINICAL				
NUMBER	DESCRIPTION	EXECUTION YEAR	SCALE	COVERAGE (Km ²)
1	BAHIA PUERTO QUEPOS	1977	1:10.000	29.3
2	PUERTO QUEPOS A DOMINICAL	1989	1:50.000	448.3

TOTAL: 2016 Km²

HYDROGRAPHIC SURVEYS COVERAGE

ANNEX H



SURVEY'S INFO

NAUTICAL CHARTS MADE			
NUMBER	NAUTICAL CHART NAME	CODE	SCALE
1	PUNTA QUEPOS ANCHORAGE	21561	1:30.000
2	PUNTA GUIJONES TO PUNTA BURICA	21560	1:300.000



SURVEY'S INFO

DULCE'S GULF				
NUMBER	DESCRIPTION	EXECUTION YEAR	SCALE	COVERAGE (Km ²)
1	GOLFITO	1996	1:5.000	4.1
2	GOLFITO	1996	1:5.000	6.1
3	GOLFITO	1996	1:10.000	19.0

TOTAL: 29.2 Km²

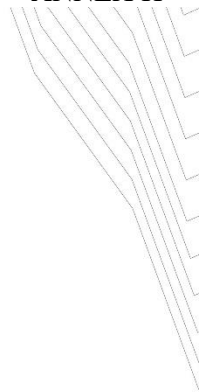
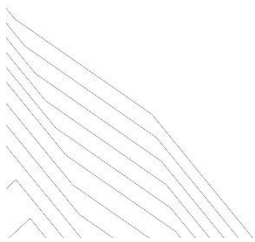
HYDROGRAPHIC SURVEYS COVERAGE

ANNEX H



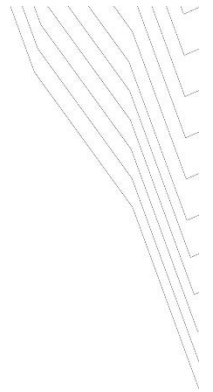
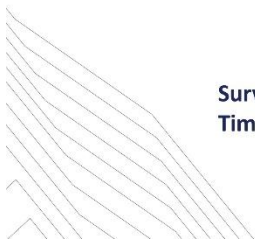
SUMMARY

NAUTICAL CHARTS MADE	
SURVEY'S MADE	NAUTICAL CHARTS MADE
17	15



Recent small hydrographic works for nautical charts (update 2011)

GENERAL DATA
SPOTS
PUNTARENAS
CALDERA
GOLFITO
LIMON
MOIN

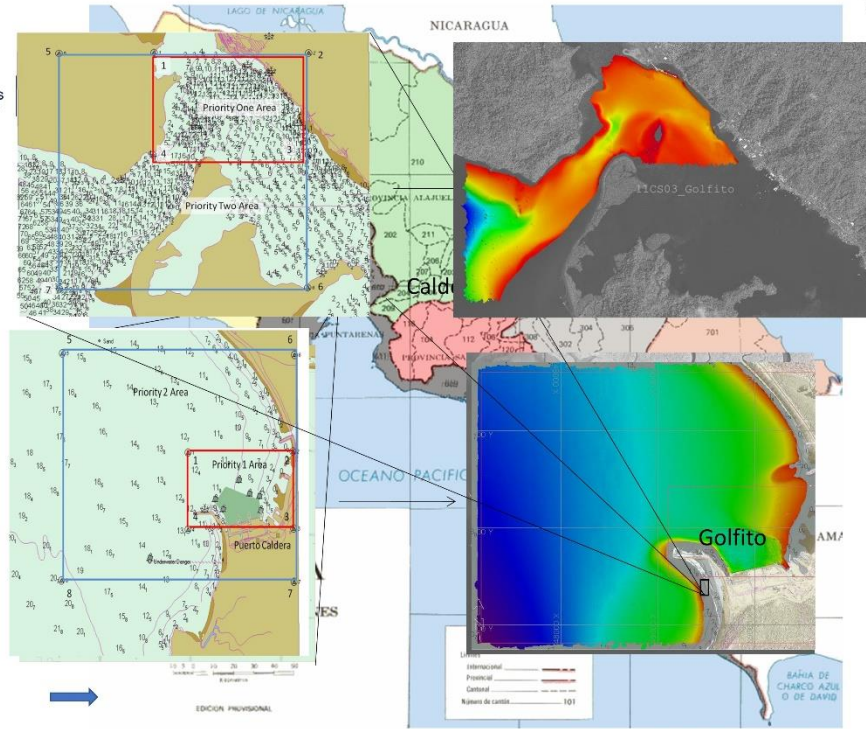


Surveys done by Fleet Survey Team to update the charts of the five ports.
Time of processing and publication of information: 1 year.

HYDROGRAPHIC SURVEYS COVERAGE

ANNEX H

MINISTERIO DE OBRAS PÚBLICAS Y TRANSPORTES



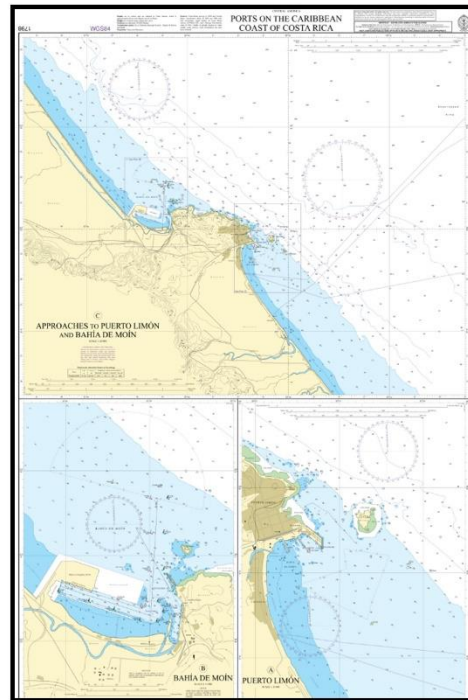
MINISTERIO DE QUAINIQUIL OBRAS PÚBLICAS Y TRANSPORTES

LSHT's surveys





4. Preparation of nautical charts.



Conclusions

1. In Costa Rica, we don't have a specific office to carry out hydrographic surveys to update nautical charts or process that information.
2. The LSHT-MPD-MOPT is the only technical group that carries out the necessary surveys used to design maritime infrastructure and analyze sedimentation processes for the Government.

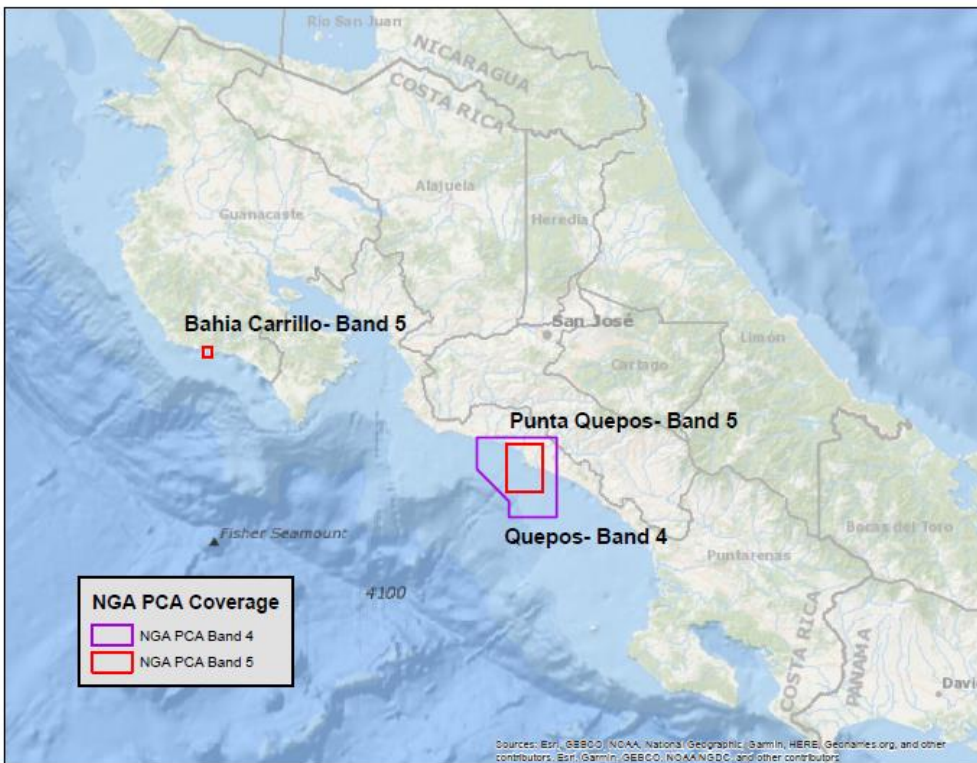
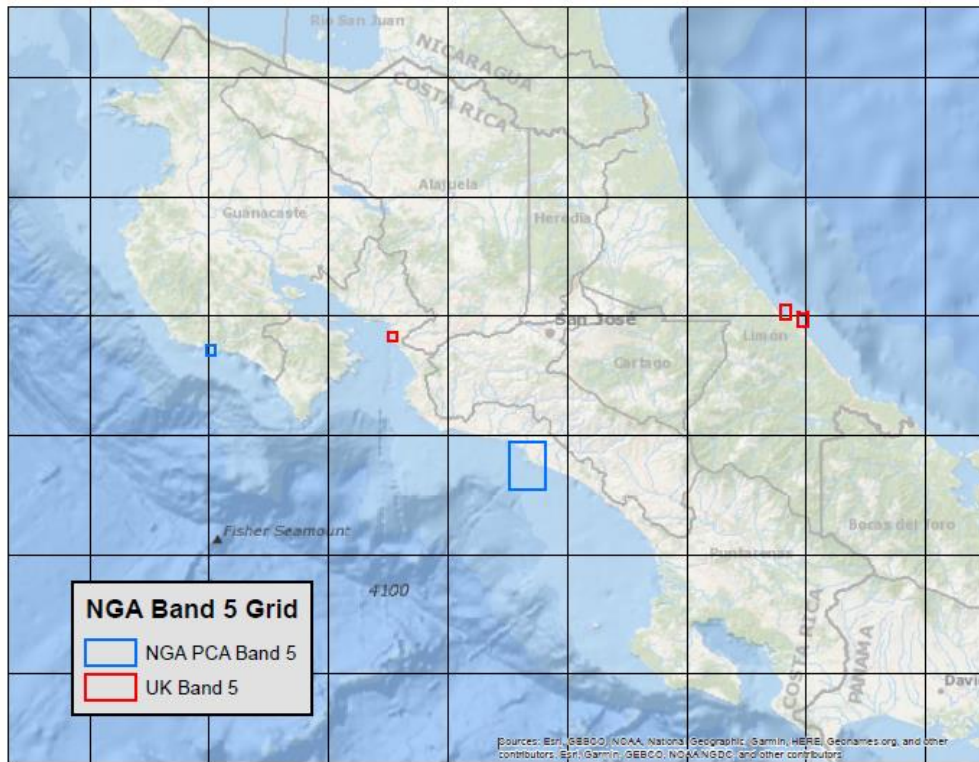
Recommendations and needs

1. Training and advice about how to organize and manage hydrographic services and nautical charting in our country.
2. Official certification for our local hydrographers.
3. Specialized equipment and software.

PCA CHART AND ENC COVERAGE

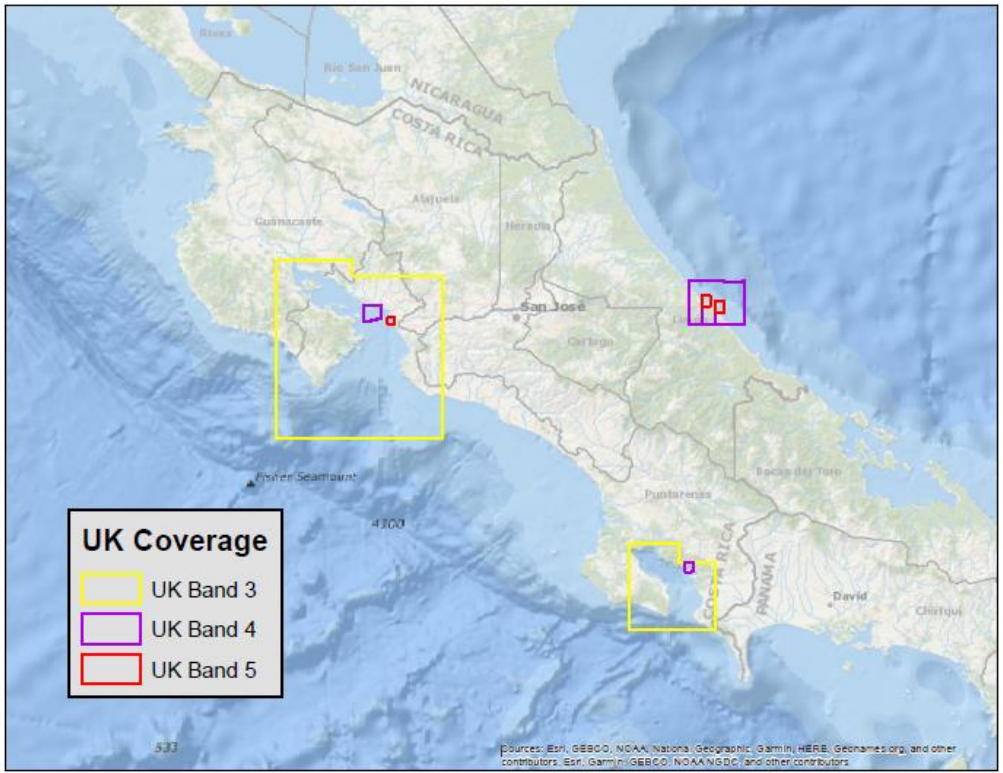
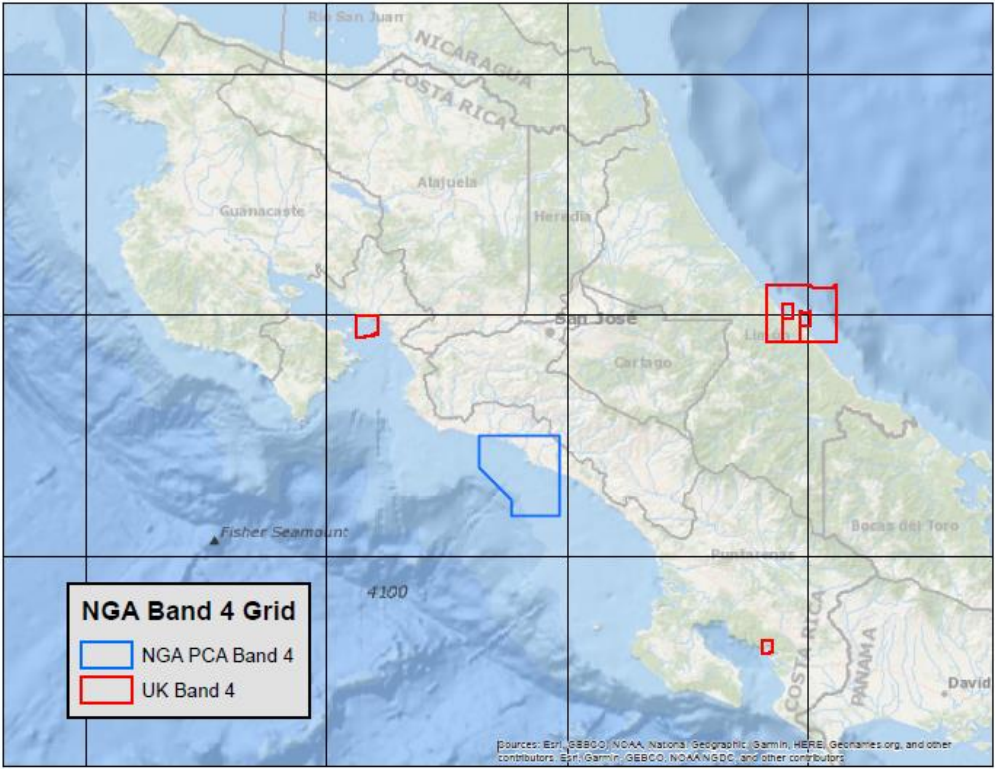
ANNEX I

UI ENC Coverage



PCA CHART AND ENC COVERAGE

ANNEX I



**22nd CONFERENCE OF THE
MESOAMERICAN AND SEA HYDROGRAPHIC COMMISSION
CARIBBEAN**

NATIONAL REPORT OF COSTA RICA FOR THE MACHC22

<p>Executive Summary</p> <p>1. Hydrographic Office / Service:</p>	<p>National Geographic Institute of Costa Rica.</p>
<p>2. Lifts:</p>	<p>Coverage of new surveys:</p> <p>Within the Hydrography Process and Topography of the Maritime Division-Port Authority of the Ministry of Public Works and Transportation, specific bathymetric surveys were carried out on a smaller scale in the following ports that are of national interest:</p> <ul style="list-style-type: none"> o Bathymetry of the northwest sector of the access channel of the Moín Port Complex, Limón. o Bathymetry of the Moín Port Complex, Limón. o Bathymetry in Puerto Golfito, Puntarenas. o Bathymetry at the Municipal Dock of Golfito, Puntarenas. o Bathymetry of the internal dock and approach area in Puerto Limón. o Bathymetry of the approach area and adjacent areas in Puerto Limón. o Bathymetry of posts 1 and 2, Port Caldera, Puntarenas. o Control bathymetry in the second half of 2021 in Puerto Caldera, Puntarenas. o Ferry terminal bathymetry in the El Carmen neighborhood, Puntarenas. o Bathymetry at the Puerto Jiménez dock and adjacent areas, Puntarenas.

	<p>By the National Tsunami Monitoring System (SINAMOT), of the National University of Costa Rica (UNA), bathymetry was carried out in the City of Limón, Limón, with the objective of numerical modeling of tsunamis.</p> <p>New technologies and/or equipment: No.</p> <p>New ships: No.</p> <p>Batimetría participativa (<i>crowdsourced bathymetry</i> - CSB) y batimetría derivada satelital (<i>satellite-derived bathymetry</i> - SDB) – national policy: Survey off Quepos and Manuel Antonio carried out by the Maritime Engineering Unit of Rivers and Estuaries (IMARES) of the Engineering Research Institute of the University of Costa Rica as part of a project of the United Nations Organization United Nations for Education, Science and Culture (UNESCO).</p> <p>Challenges and achievements:</p> <ul style="list-style-type: none"> o Create a National Hydrography Committee, or any other similar structure. o That this structure develop a work plan for hydrographic development, the preparation and publication of nautical charts and actions to strengthen navigation safety. o Establish international cooperation agreements for the development of hydrographic surveys and production of nautical charts. o The COVID-19 pandemic hinders or delays hydrographic management in the countries.
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	<ul style="list-style-type: none"> o Obtain ships and resources at a general level.
<p>3. New Cards and updates:</p>	<p>ENCs coverage, white spaces and overlaps: No.</p> <p>ENC distribution method. RNCs: No.</p> <p>INT. Charts: The International Bathymetric Chart of the Caribbean Sea and Gulf of Mexico (IBBCA) project was completed.</p> <p>National Paper Letters: No.</p> <p>Other letters, eg. for pleasure boats: No.</p> <p>Challenges and achievements:</p> <ul style="list-style-type: none"> o Establish international cooperation agreements for the development of hydrographic surveys and production of nautical charts. o The COVID-19 pandemic hinders or delays the preparation or updating of nautical charts.
<p>4. New posts and updates: New Posts: No.</p>	<p>Posts updated: No.</p> <p>Means of delivery, e.g. paper, digital: No.</p> <p>Challenges and achievement: At the moment no actions are determined for publications.</p>
<p>5. Maritime Safety Information (ISM)/Maritime Safety Information (MSI):</p>	<p>Existing transmission infrastructure: Important information on maritime safety is disseminated to mariners, through the publication of notices on the website of the Ministry of Public Works and Transport.</p> <p>National Coordinator Job Statistics: No.</p>

	<p>New infrastructure in accordance with the Global Maritime Distress Safety System (GMDSS) Master Plan: No.</p> <p>Challenges and achievements:</p> <p>The contact person for Costa Rica before the MACHC to prepare and provide information related to Maritime Safety (ISM-MSI) was determined.</p>
<p>6. Status of Hydrographic Surveys and Cartography worldwide (C-55):</p>	<p>Last update: the information published in the <i>State of Hydrographic Surveys and Nautical Cartography worldwide IHO/OHI Publication C-55</i>, dated <i>October 26, 2021</i>, is maintained .</p>
<p>7. Capacity Building:</p>	<p>Supply and/or demand for Capacity Building: A specialized course is required for the development of digital nautical cartography and the processing of nautical information.</p> <p>CADET B training is also needed.</p> <p>Training received, necessary, offered: No.</p> <p>Status of national, bilateral, multilateral or regional development projects with a hydrographic component (in progress, planned, under evaluation or study): Two draft agreements are being analyzed and prepared:</p> <ul style="list-style-type: none"> o With the United Kingdom Hydrographic Office (UKHO) for the cooperation and dissemination of digital and paper nautical charts. o With the National Geospatial Intelligence Agency of the United States of America (NGA), for the development and training of nautical charts.

	<p>Definition of proposals and requests to the IHO Capacity Building Sub-Committee (CBSC): No</p>
<p>8. Oceanographic Activities:</p>	<p>Generalities: The three tide gauges are maintained.</p> <p>GEBCO/IBC activities, GEBCO Seabed 2030 activities: Active participation in the Seabed 2030 project.</p> <p>Tidal network: No. New team: No.</p> <p>Challenges and achievements: The Quepos and Limón tide gauges are under repair. The challenge has been to repair them without the support of experts from the <i>University of Hawaii Sea Level Center (UHSLC)</i>, who cannot travel yet due to COVID-19.</p> <p>The current tide gauges are managed by the National Tsunami Monitoring System Program (SINAMOT), of the National University of Costa Rica (UNA).</p>
<p>9. Spatial data infrastructure:</p>	<p>Status of the Marine Spatial Data Infrastructure (IDEM) / <i>Marine Spatial Data Infrastructure (MSDI)</i>: There is no marine spatial data infrastructure (MSDI).</p> <p>Relationship with the National Spatial Data Infrastructure: The Costa Rica Spatial Data Infrastructure (IDECORI) is recently created, and is in a long-term implementation process.</p> <p>As of June 2021, conversations have been advanced through the Institute Costa Rican Fisheries and Aquaculture (INCOPESCA) with the Commission for the Marine Governance, which is made up of senior officials from the Ministry of Security Public, Ministry of Agriculture and Livestock, Ministry of Environment and Energy, Ministry of Public Works and Transportation and Costa Rican Institute of Tourism, to assess the incorporation into the</p>

	<p>geoportal of the National Territorial Information System (SNIT) of the National Geographic Institute, of information on marine areas by the entities that make up this Commission.</p> <p>Participation in regional or global IDEM/MSDI efforts: No.</p> <p>National implementation of the Shared Data Principles – including any national data policy and impact on marine data: No.</p> <p>National IDEM/MSDI Portal: No.</p> <p>Best practices and lessons learned: No.</p> <p>Challenges and achievements: Creation of a marine spatial data infrastructure (MSDI).</p>
10. Innovation	<p>Use of new technologies: No.</p> <p>Risk assessment: No.</p> <p>Policy issues: No.</p>
11. Other activities	<p>Participation in IHO meetings: Participation in:</p> <ul style="list-style-type: none"> ○ Hydrographic Commission or The Mesoamerican and Caribbean Sea (MACHC). ○ In the International Bathymetric Chart of the Caribbean Sea and Gulf of Mexico (IBBCA). ○ In the Nippon Foundation-GEBCO Seabed 2030 Project. <p>Meteorological data collection: This work is carried out by the National Meteorological Institute of Costa Rica.</p> <p>Geospatial studies: The National Geographic Institute of Costa Rica carries out multiple geospatial studies.</p>

<p>12. Conclusions:</p>	<p>Preparation to respond to disasters: In Costa Rica we have the National Commission for Risk Prevention and Emergency Response.</p> <p>Environmental protection: The Ministry of Environment and Energy is in charge.</p> <p>Commitment to Maritime Administration: Does not exist.</p> <p>Maritime signaling and navigation aids issues: We have:</p> <ul style="list-style-type: none"> o The Maritime-Port Division of the Ministry of Public Works and Transport, which has a database of all floating and land navigation aids in ports nationwide. o The National Tsunami Monitoring System (SINAMOT) of the National University of Costa Rica (UNA) constantly develops educational and informative material for the prevention and response of tsunami emergencies. <p>Magnetic and gravimetric surveys: The active and passive national geodetic framework is the responsibility of the National Geographic Institute of Costa Rica.</p> <p>International commitments: Various in geographical, cartographic, geodetic, geophysical and hydrographic matters.</p>
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<ul style="list-style-type: none"> o There is no National Hydrographic Committee that is in charge of everything related to the hydrography of the country, that manages and plans the actions. o There is no organization in Costa Rica that is regularly responsible for the execution of hydrographic surveys to update nautical charts.

- There is no system for managing and disseminating sensitive information for the navigation safety.
- We do not have a Marine Spatial Data Infrastructure (MSDI).
- Hydrographic surveys need to be carried out at the country level.
- It is necessary to continuously and permanently create nautical charts of the country.
- There are very few resources at a general level to carry out good management hydrographic.

- a) Aware of the socio-economic benefit that this means, it is recommended to consider as a priority that the MOPT and the IGN adopt the measures to formalize and strengthen capacities in hydro-cartographic matters and navigation safety, which allows, among others, to comply the responsibilities stipulated in the SOLAS convention, in coordination with other related national institutions.
- b) Aware of what is essential for the socio-economic progress of the country in the maritime sector and other areas, it is recommended to establish a National Hydrography Committee with the responsibility of coordinating hydrographic, nautical cartographic and navigation safety activities. national and regional and international level. The establishment of this National Hydrographic Committee should be considered a priority issue.
- c) Once the National Hydrography Committee has been established, it is recommended that it give priority to the identification of a work program that is consistent with the interests of Costa Rica in matters of hydrographic development, nautical cartography and safety of navigation, viable and sustainable in time.
- d) The structure of the IHO considers the existence of Regional Hydrographic Commissions (CHR), for the coordination and treatment of common problems. In this sense, strongly recommends that Costa Rica exhaust the means to be represented and have an active participation in the MACHC meetings, the next one to be held in St. Kitts and Nevis, from December 5 to 9, 2011, and choose the different training opportunities that the IHO may offer at the request of States that form the CHRs.
- e) It is in the interest of the IHO, and constitutes its mission and objective, that this technical visit effectively contributes to facilitating the establishment of a solid and sustainable hydrographic capacity in Costa Rica. It is recommended to maintain contact with the IHB at the effects of permanently monitoring the initiatives identified, whose implementation depends exclusively on the Costa Rican authorities. However, the OHI remains attentive to concur with your support to facilitate the process, if it is deemed necessary.
- f) Establish bi-lateral agreements with the countries that carry out the surveys hydrographic and with those who produce nautical charts on behalf of Costa Rica.

Recommendations proposed of an URGENT nature

- a) Establish a system of promulgation of Notices to Boaters. It is recommended coordinate training and procedures with the Chairman of the Sub-Committee on World Navigational Advisory Service (WWNWS-SC), Mr. Peter DOHERTY at the following e-mail: Peter.M.Doherty@nga.mil.
- b) Summon the three organizations visited to a meeting to agree on the measures tending to establish the National Hydrography Committee (or similar body of coordination).
- c) Participate in the 12th MACHC meeting in St. Kitts and Nevis, in December 2011.