PANAMA CANAL EXPANSION
"A MOMENT FOR ENGINEERING"

Engineer Ilya Espino de Marotta
Executive Vice President for Engineering and Program Administration
Panama’s maritime hub
- 144 trade routes
- 1700 ports
- 160 countries
Transits vs PC/UMS Tonnage
FY 1914 – FY 2015

Fiscal Year

PC/UMS tonnage in millions

Transits
Main Components & Interaction for Analysis

- Communications Plan
- Risk, Finances & Profitability
- Excavated Material
- Regulatory & Legal Framework
- Locks & Channels
- Water Sources
- Community & Environment
- Capacity & Service
- Market & Price Strategy

Socio-Economical Impact

Main Components & Interaction for Analysis
World wide companies that participated in the Study Plan
Dimensions of Locks and Ships

Maximum size of vessels in existing Locks: 4,400 TEU

Maximum size of vessels in new Locks: 13,000 – 14,000 TEU
Vessels in Fleet

2014

- Panamax or less: 1,213 (23.9%)
- Neopanamax: 3,791 (74.6%)
- Post Panamax: 78 (1.5%)


2018

- Panamax or less: 1,431 (25.7%)
- Neopanamax: 3,961 (71.1%)
- Post Panamax: 176 (3.2%)

Design and Construction of Locks
Financing shall cover for $2.3 billion of the $5.25 billion budgeted for the Program and shall be disbursed as follows:

The negotiated financing structure includes provisions that are favorable for the ACP, including a 20-year repayment period and a 10-year grace period.
Atlantic Neopanamax Locks

Pacific Entrance Deepening and Widening

Atlantic Entrance Deepening and Widening
17.66 M\text{m}^3

Raising of Gatun Lake
Maximum Operation Level
26.7 m → 27.1 m

Gatun Lake Deepening and Widening
and Culebra Cut Deepening
26 M\text{m}^3

Pacific Neopanamax Locks

Pacific Neopanamax Locks Access Channel
49.5 M\text{m}^3

Deepening and Widening
8.6 M\text{m}^3
Pacific Entrance Deepening and Widening

- Volume: 8.7 M m³
- Width: 225 m
- Length: 14 km
- Dredging International
- Amount: $177,500,676.78
- April 2008/ June 2013
Equipment used for contract execution

BREYDEL

VLAANDEREN XIX

D’Artagnan

Lange Wapper

Yuan Dong 007
Equipment used for contract execution
Atlantic Entrance Deepening and Widening

- **Volume:** 17.6 M m³
- **Width:** 520 to 300 m
- **Length:** 9.6 km
- **Jan De Nul n.v.**
- **Amount:** $144,236,596.44
- **September 2009 /April 2013**
Atlantic Entrance Deepening and Widening
Equipment used for contract execution
Dredging of Gatun Lake and Culebra Cut

25.2 M m³ excavated
Dredging of Gatun Lake and Culebra Cut

- Length: 36 km
- Depth: 16.7 m

<table>
<thead>
<tr>
<th>Width</th>
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<td>Peña Blanca</td>
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<td>Gatun</td>
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<tr>
<td>Balsa</td>
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25.2 M m³ dredged
Culebra Cut dredging areas

- **Bas Obispo**: Actual Volume: 598 K m³
- **Las Cascadas**: Actual Volume: 412 K m³
- **Emperador**: Actual Volume: 654 K m³
- **Cunette**: Actual Volume: 227 K m³
- **Culebra**: Actual Volume: 491 K m³
- **Cucharacha**: Actual Volume: 204 K m³

- **Dredge Cornelius**
  - Width: 192 m
  - Length: 13.5 km
  - Deep: 16.73 m with 60 cm tolerance
Dredging of Gatun Lake and Culebra Cut
Dredging of Gatun Lake and Culebra Cut
300,000 lb = 136 metric tons
Gatun Lake and Culebra Cut dredging areas

- Dredge R.M. Christensen
- Dredge Cornelius
- Dredge Mindi
- Dredge Quibian I
- Dredge Alberto Alemán Zubieta
Dredging of Gatun Lake and Culebra Cut
Location of 8X26 Atlantic buoys
Pacific Access Channel North Entrance

Pedro Miguel Locks

Miraflores Locks

Cocoli Neopanamax Locks

29-Jan-2016
Pacific Access Channel

MEC 3
80 Ha

Borinquen Dam

PAC 1
PAC 2
PAC 3
Removal of MECs
Pacific Access Channel

- PAC: awarding of last contract on 7-Jan-10
- Company: Consortium ICA-FCC-MECO
- Amount: B/. 267,798,795.99
- Order to proceed: 22-Jan-10
- Start: 27-Apr-10
- Estimated completion date: 20-Sep-15

49.6 M m³ excavated
Pacific Access Channel – Phase 4

26.6 M m³ excavated
Borinquen Dam
Foundation – Borinquen Dam
Foundation – Borinquen Dam
Crushing plants
Pacific Access Channel – Phase 4
Material stockpiling – Borinquen Dam

Clay

Filters
Clay – Borinquen Dam
Clay stockpiling – Borinquen Dam
Filter placement – Borinquen Dam
Borinquen Dam – clay core – northern sector
Locks design and construction

Excavation and dredging volume: 48.7 M m³
## Prequalified Consortia

<table>
<thead>
<tr>
<th>Consortium</th>
<th>Members</th>
<th>Designers</th>
<th>Gate fabricators</th>
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<tr>
<td>C.A.N.A.L.</td>
<td>ACS Servicios, Comunicaciones y Energía, S.L. – Líder</td>
<td>Sener Ingeniería y Sistemas</td>
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<td>Haskoning Nederland BV</td>
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<td>Fomento de Construcciones y Contratas, S.A.</td>
<td>Mott Macdonald Limited</td>
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<td>Hochtief Construction AG</td>
<td>Hochtief Consult</td>
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<td>Bouygues Travaux Publics – Líder</td>
<td>AECOM – Líder</td>
<td>ALSTOM Hydro Energía Brasil</td>
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<td>Bilfinger Berger</td>
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<td>VINCI Construction Grands Projets</td>
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<td>Construtora Queiroz Galvao S.A.</td>
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<td>BARDELLA Ind. Mecánicas</td>
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<td>Bechtel, Taisei, Mitsubishi</td>
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<td>Bechtel Internacional, Inc. – Líder</td>
<td>Wuchang Shipyard</td>
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<td>Corporation</td>
<td>Taisei Corporation</td>
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<td>Mitsubishi Corporation</td>
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<td>Grupo Unidos por el Canal</td>
<td>Sacyr Vallehermoso S.A. – Líder</td>
<td>Montgomery Watson Harza (MWH) – Líder</td>
<td>Heerema Fabrication Group</td>
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<td>Impregilo S.p.A.</td>
<td>IV-Groep</td>
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<td>Jan de Nul n.v.</td>
<td>Tetra Tech</td>
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<td>Constructora Urbana, S.A.</td>
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</table>
Physical Model (Lyon)

1.83 m
Locks
Locks
Locks
Repairs on culverts
Water-saving basin filling
With the water-saving basins, the new locks will utilize 7% less water than the existing locks.
Locks – Pacific Sector – Basin filling
Locks – Atlantic Sector – Basin filling
Pacific Locks
Control Tower, Building and Gates – Pacific Locks
Pacific Locks – Intermediate plug
Atlantic Locks
Bollards, Capstans and Luminaires
Installation of Valves - Locks

Válvula V285P y mampara de equalización V288P, LH1 oeste, Pacífico
# Shipment and arrival - valves

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<td>22-Mar-13</td>
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<td>26</td>
<td>2-May-13</td>
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<td>14-Jun-13</td>
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<td>22</td>
<td>26-Aug-13</td>
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<td>12 + 1 replacements</td>
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<tr>
<td>24-Dec-12</td>
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<tr>
<td>22-Mar-13</td>
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<td>14-Jun-13</td>
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<tr>
<td>26-Aug-13</td>
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<tr>
<td>06-Dec-13</td>
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<td>24-Dec-12</td>
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<td>22-Mar-13</td>
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<td>14-Jun-13</td>
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<td>26-Aug-13</td>
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<td>06-Dec-13</td>
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</table>
Gates - Progress


Lago Gatún

El. +28.70 muro

Cámara superior
El. -2.64

Cámara media
El. -11.63

Cámara inferior
El. -20.62

Río Chagres

Caue de aproximación

NUEVAS ESCLUSAS EN COCOLÍ

Océano Pacífico
Transportation and installation of gates – Atlantic site

Offloading dock for gates

Depth of piles: 30 m
Transportation and installation of gates
Gates fabrication
Transportation of gates
MV Baroque – Testing period at Agua Clara locks
Transit at Agua Clara locks
Raising of Gatun Lake Maximum Operation Level
Water-supply improvement - Contracts for the remediation of third-party structures
Water-supply improvement - Contracts for the remediation of third-party structures

- Paraiso water intake
- Las Cruces landing
- Gamboa pilot dock
Environmental impact study
Compensation to the ANAM and ARAP
Wildlife rescue plan
Archaeological rescue plan
Reforestation program
Water- and air-quality monitoring plan
Noise and vibration monitoring plan
Community outreach
Independent environmental audits

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<th>Compensation</th>
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<td>Expansion Program</td>
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<td>B/. 3,499,034.95</td>
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<td>ARAP</td>
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<td><strong>Total</strong></td>
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## Reforestation Projects

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<td>1 LAKE DREDGING</td>
<td>Volcan Baru National Park</td>
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<td>2 LOCKS</td>
<td>Mangrove - Chiriqui Viejo</td>
<td>50</td>
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<td>3 PAC 3 AND PAC 4</td>
<td>Forestal Investigation Center</td>
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<td>4 PAC 4</td>
<td>Montuoso Forestal Reserve</td>
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<td>5 PAC 2 AND PAC 3</td>
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<td>6 PAC 2</td>
<td>Campana National Park</td>
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<td>7 PAC 1</td>
<td>Camino De Cruces National Park</td>
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<td>8 PAC 3</td>
<td>Chagres National Park</td>
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<td>9 LOCKS</td>
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<td>10 PAC 4</td>
<td>Chame</td>
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**TOTAL**: 937
Reforestation Projects
Wildlife rescued: 6102 individuals – 50% mammals, the rest includes birds, reptiles, and amphibious
Paleontology

- Company: Smithsonian Tropical Research Institute (STRI)
- Start date: 10 January 2008
- Amount: B/. 1,000,000.00
- End date: 15 March 2013
Archeological surveys
Archeolóogical rescues
Contractual requirement complied

Historical artifacts recovered: 2,000
SOCIAL
# Expansion Program Communication

## COMMUNICATION CAMPAIGN

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<td>Number of visitors - PAC 1</td>
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<tr>
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<td>Number of visitors - PAC 3</td>
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<tr>
<td>Number of visitors - PAC 4</td>
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<tr>
<td>Number of visitors - Atlantic (Locks and Dredging)</td>
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<td>Number of visitors - Cerro Cocolí Lookout Point</td>
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<td>Speeches and Presentations</td>
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## MEDIA CARE

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## PUBLIC CARE

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<td>Expansion Program Observation Center– Atlantic</td>
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RESULTS

IARC
2007-2016

- Art Work: 89
- Oral history: 447 (468.9h)
- Other interviews: 730
- HD videos: 463.86h
- Objets: 1,381
- Physical documents: 3,510
- Electronic documents: 28,666
- Arts and 3D Animations: 851
- Photographs: 375,642
Panama Canal Expansion Reports

- Advisory Board Monthly: 87
- Board of Directors Monthly: 117
- Quarterly to the Nation: 39
- Quarterly to MLAs: 32
- Monthly to Owner Controlled Insurance Program (OCIP): 76
On year 2013 the Institute for Professional Formation and Training for Human Development (INADEH) began training courses to provide the students with the necessary tools to face the challenges of the Expanded Canal.

These courses covered five basic areas:

- Construction and masonry
- Welding
- Mechanics
- Heavy equipment operators
- Electricity

The INADEH and ACP are closely working to ensure the existence of this human resource in Panamá when required, and that it shall not be necessary to import labor for technical positions.
A total of 1,281 Expansion Program workers form part of the Canal work force.

Jobs generated between Contractors and Subcontractors amount to 39,807.

Altogether, they make a total of 41,088 jobs.
PANAMA CANAL EXPANSION
"A MOMENT FOR ENGINEERING"

Engineer Ilya Espino de Marotta
Executive Vice President for Engineering and Program Administration

06.23.2016