

# PANAMA CANAL EXPANSION PROGRAM

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2011



CANAL DE PANAMÁ

# Expansion Program Components

## Post-Panamax Locks

Construction of the new Post-Panamax locks on the Pacific and Atlantic sides. The new locks complexes will have three chambers each with water-saving basins, a lateral filling and emptying system and rolling gates.

## Pacific Access Channel

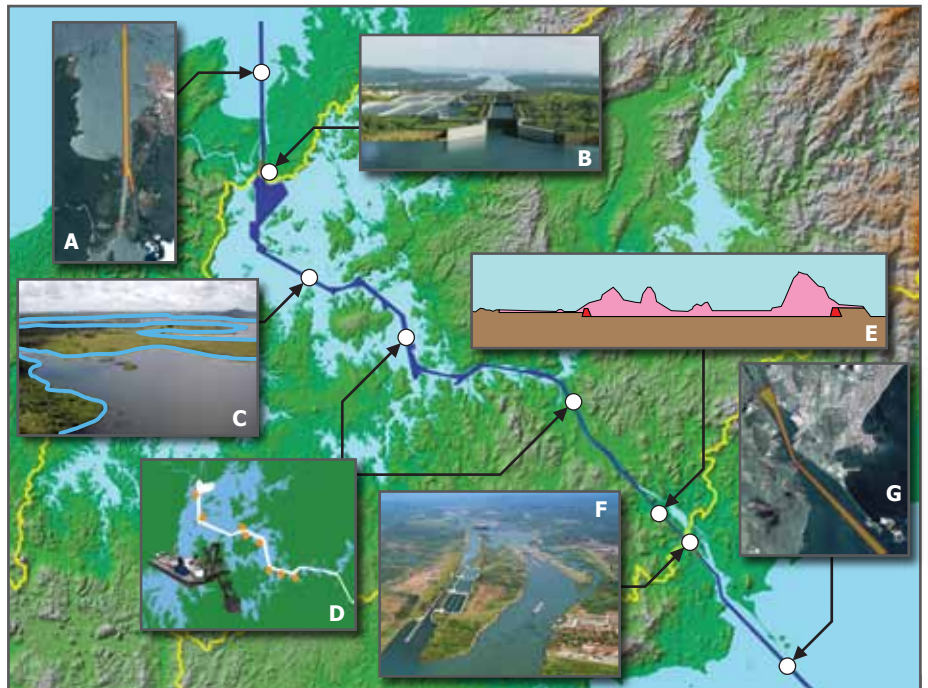
Excavation of the new Pacific Post-Panamax locks north Access channel. The project requires dry excavation of approximately 50 million cubic meters of material along 6.1 kilometers. Executed in four different phases (PACs 1 – 4).

## Improvements to Navigational Channels

Both entrances to the Canal (Atlantic and Pacific) are being dredged, as well as Culebra Cut and Gatun Lake.

## Improvements to Water Supply

The project calls for the increase of Gatun Lake's maximum operating level by 45 centimeters to improve Canal water supply and draft dependability.



1. Dredging of the Atlantic entrance
2. New Atlantic locks
3. Gatun Lake

- A. Atlantic entrance deepening and widening
- B. Atlantic Post-Panamax locks
- C. Increasing Gatun Lake's maximum operating level
- D. Deepening and widening of Gatun Lake and Culebra Cut navigational channels
- E. Post-Panamax locks Pacific access channel
- F. Pacific Post-Panamax locks
- G. Pacific entrance deepening and widening



## Projects

**By May 2011, contracts for a total of \$4,224 million had already been awarded.**

### Pacific Access Channel

Construction of a new access channel to link the Third Set of Locks, on the Pacific side, to Culebra Cut has been under construction since September 2007. This project calls for the excavation of some 50 million cubic meters of material. To date, more than half of this total has already been excavated by the different contractors.

Progress on these excavations can be clearly seen from the location of the former Paraiso Hill, the area where nearly four years ago the Canal Expansion Program was inaugurated. Originally 136 meters high, the hill has been reduced to 27.5 meters above lake level and contractors are now preparing to further reduce it to 9.14 meters.

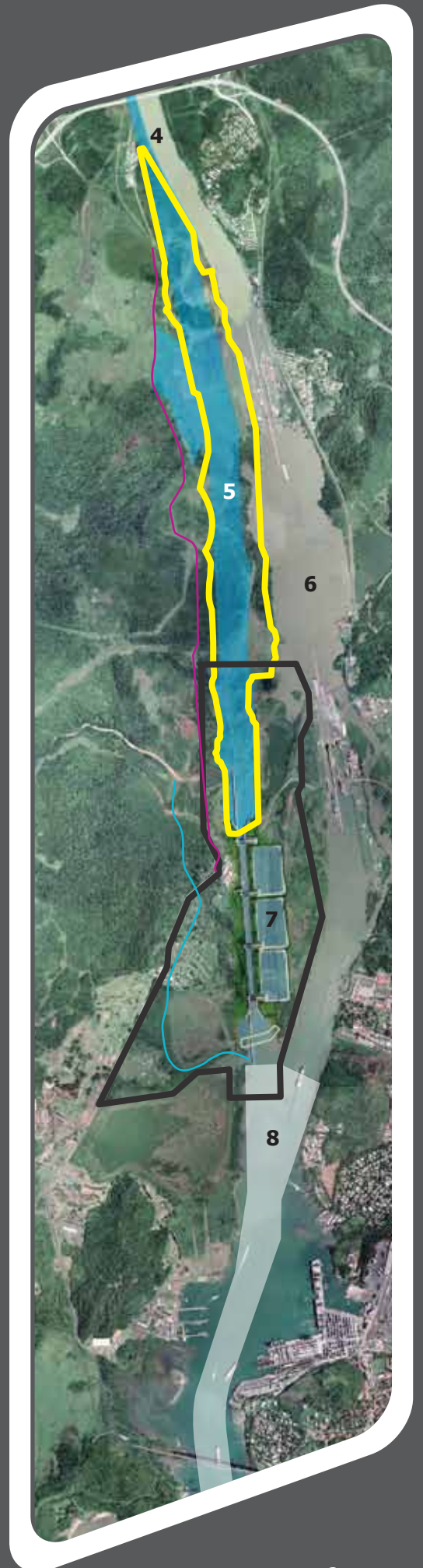


Borinquen Dam cofferdam

At this stage, preparations for the construction of a 2.3 kilometer-long dam that will separate the waters of Miraflores Lake from the access channel to the new Pacific locks are also underway.

Excavation activities for the Pacific Access Channel have also required the clearing of more than 400 hectares of land contaminated with unexploded ordnance (UXO) left behind by the US military during its presence in Panama.

4. Culebra Cut
5. PAC
6. Miraflores Lake
7. New Pacific Locks
8. Pacific Entrance Dredging





View of the Pacific Access Channel from the Centennial Bridge

## Dredging

Dredging activities to enable the safe navigation of Post-Panamax vessels once the Panama Canal is expanded are also part of the expansion program. Current activities include dredging of the Canal entrances on the Pacific and Atlantic sides as well as the existing navigation channels in Gatun Lake and Culebra Cut.

Bathymetric measurements that allow verifying and certifying the depths reached as well as the volumes dredged are included in monthly reports for validation by Panama Canal officials.

In doing so, the Topographic, Hydrographic and Surveys Section increased its fleet by adding the latest technology. Five additional survey launches will join the fleet this year.

### Pacific

This contract was awarded on April 1, 2008 to Belgian company Dredging International.

The project consists of the widening of the Panama Canal Pacific entrance navigational channel to a minimum 225 meters and deepening to 15.5 meters below mean low water level, as well as partial construction of the Pacific Post-Panamax locks south access. A total of 8.7 million cubic meters of material will be removed as part of this project.

In January of this year, the D'Artagnan, one of the world's most powerful cutter-suction dredges, joined Dredging International's fleet.

### Atlantic

This contract was awarded to Belgian company Jan de Nul n.v. on September 25, 2009, for a total of \$89.6 million. The work includes dredging and dry excavation of approximately 17.9 million cubic meters of material.

An area of approximately 13.8 kilometers is being dredged and the existing Atlantic entrance navigation channel is being widened from its current 198 meters



Dredging work at the Pacific entrance - dredge D'Artagnan

to a minimum 225 meters, and the north access channel to the new locks on the Atlantic side is being widened to a minimum 218 meters.

This contract includes an option for additional deepening up to 16.1 meters, which represents a volume of 2.3 million cubic meters of material, at a cost of \$16,411,600.



Dredging work on the Atlantic side

### Gatun Lake and Culebra Cut

This Project entails the removal of some 30 million cubic meters of material to deepen and widen Gatun Lake navigational channels and deepen the navigational channel at Culebra Cut.

The Canal workforce is responsible for conducting part of the work. The rest has been awarded to contractors as follows: Jan De Nul n.v. is in charge of dredging the



Dredging work at Culebra Cut - dredge Quibian I

new north entrance to the Pacific Access channel, and Dredging International will complete dredging of the northern reaches along the Gatun Lake navigational channel.

The new cutter-suction dredge Quibian I arrived in Panamanian waters in early April to support dredging activities in the lake and Cut.

### Raising Gatun Lake's Maximum Operating Level

This component will enable increasing Gatun Lake's maximum operating level by 45 centimeters, from its current 26.7 meters to 27.1 meters.

The project will provide additional storage capacity for more than 200 million cubic meters of water in the lake – enough for three additional daily transits.

The work calls for the modification of certain structures, including the hydraulic cylinders that open and close the gates at Pedro Miguel Locks and the Gatun Locks upper level and the gates at Gatun Dam, among others.



Modification of Gatun spillway gates

Four gates have already been extended, while two new ones were fabricated at the Canal industrial area. Two new caissons were procured to complement the operation and maintenance of the extended spillway gates. Parallel to the extension of the gates, Canal personnel are testing seal prototypes for the existing locks submersible hydraulic arms in Pedro Miguel and Gatun and designs for the necessary modifications to the corresponding gates are being prepared.

# Third Set of Locks

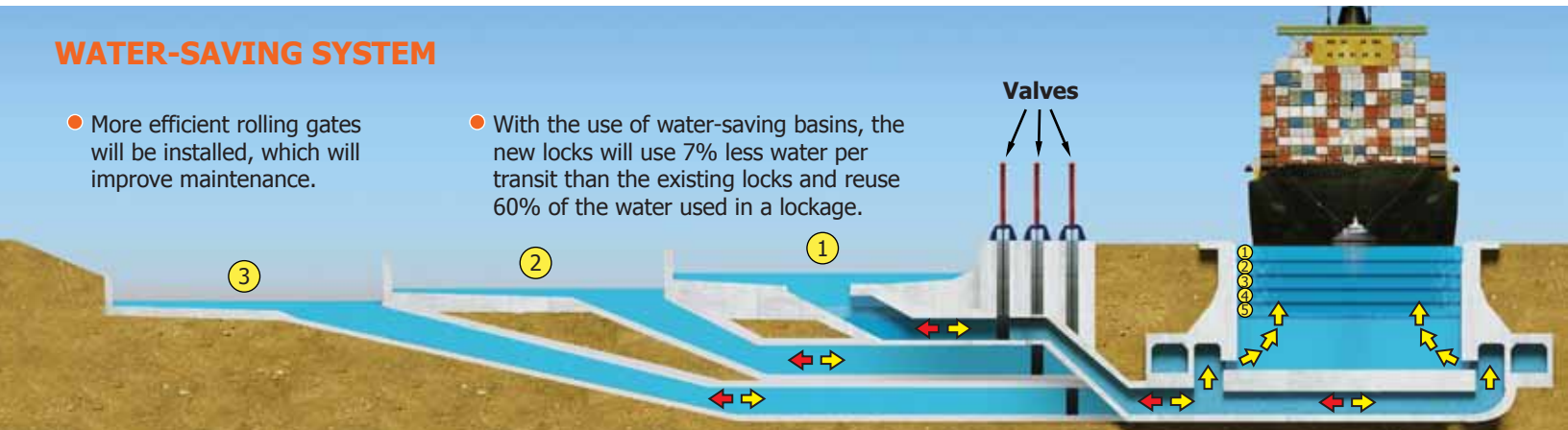


## POST-PANAMAX LOCKS

The new locks complexes will have three chambers each, water-saving basins, a lateral filling and emptying system and rolling gates.

## WATER-SAVING SYSTEM

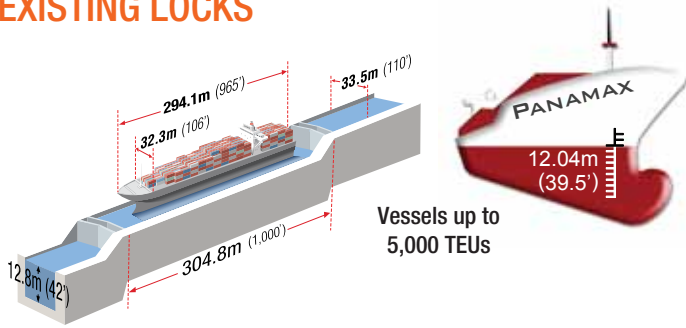
- More efficient rolling gates will be installed, which will improve maintenance.
- With the use of water-saving basins, the new locks will use 7% less water per transit than the existing locks and reuse 60% of the water used in a lockage.



①, ② & ③: Water is transferred by gravity to WSBs to be reused in the following lockage.  
④ & ⑤: Once equalized, it moves to the next level and eventually to sea.

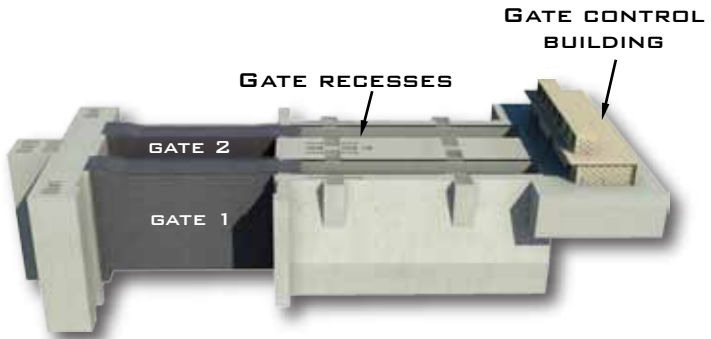
# General Information on the New Locks

## EXISTING LOCKS



Vessels up to 5,000 TEUs

## RECESSES AND GATES

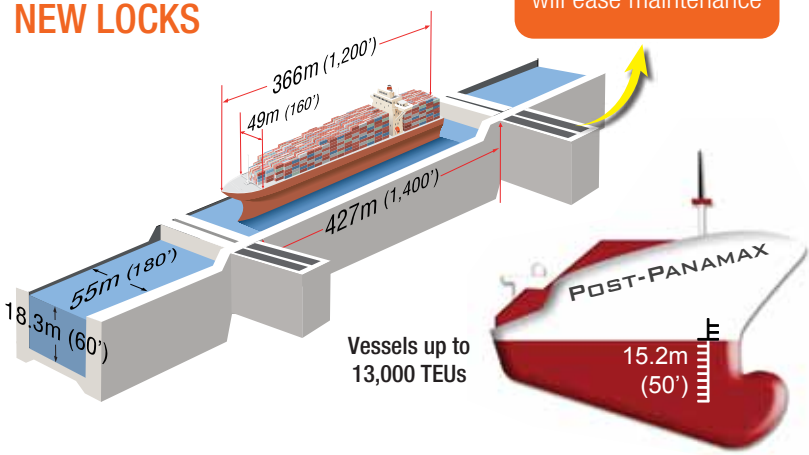


The use of rolling gates will ease maintenance

The new locks will require 16 rolling-type gates that will operate from adjacent recesses located perpendicular to the lock chambers. Such gate configuration allows each recess to perform as a dry dock, which in turn enables servicing the gates on site without the need to remove them and therefore interrupt lock operations.

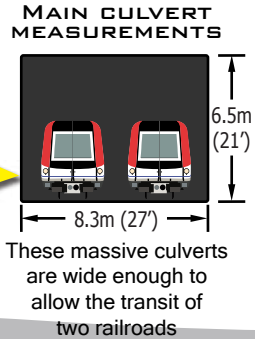
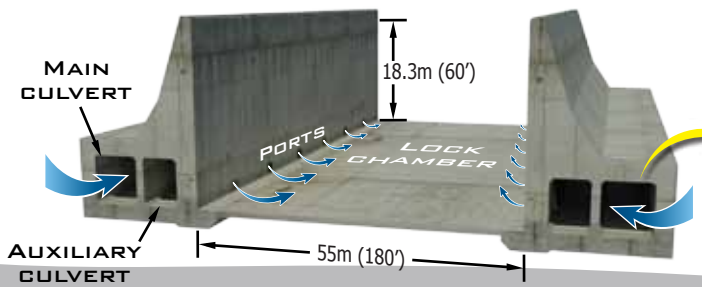
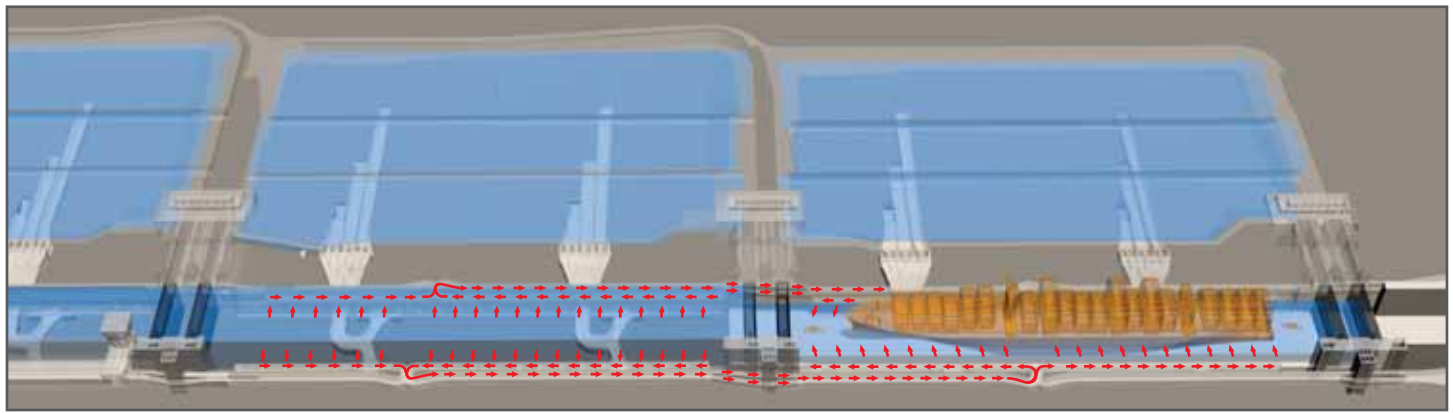
This results in increased lockage capacity and more flexible transit operations and provides for shorter, more cost-effective maintenance periods.

## NEW LOCKS



Vessels up to 13,000 TEUs

## CULVERT SYSTEM AND WATER-SAVING BASINS



These massive culverts are wide enough to allow the transit of two railroads

The existing Canal's filling and emptying system works through a series of ports located at the bottom of the chambers. The Third Set of Locks will operate with a system of lateral ports located in the chamber walls. The system will allow filling each lock chamber in 17 minutes with the use of water-saving basins and 10 minutes without.



Ongoing work at the new locks and industrial park under the locks design and construction project on the Atlantic side.

## Design and Construction of the Third Set of Locks

This is the largest and most complex project under the Expansion Program. At a cost of \$3.2 billion, the contract was awarded on July 15, 2009 to Grupo Unidos por el Canal, a consortium formed by companies Sacyr

Vallehermoso, S.A. of Spain; Impregilo SpA of Italy; Jan de Nul n.v. of Belgium; and Constructora Urbana, S.A. of Panama. The contractor formally commenced the works on August 25 of the same year.



Work in the area of one of the Third Set of Locks gate recesses on the Atlantic side

The project involves the construction of two mirror sets of locks, one on the Pacific and the other on the Atlantic, each with a total of nine water-saving basins and a redundant system of eight rolling gates per lock. The designs for the Third Set of Locks, as well as the fabrication of its different components, are being done in different parts of the world.

To build the new locks, the contractor installed its own industrial parks where the concrete that will shape the massive structures will be mixed. The rock dug out from the excavation area on the Pacific side, known as basalt, will be crushed and used as aggregate and sand for the mix.

## Environment

Protecting the environment is a priority in the Expansion Program. The Canal, along with the contractors in charge of each component and in coordination with institutions such as Panama's National Environmental Authority (ANAM), conducts wildlife rescue and relocation activities as work progresses in the different projects. Mammals, reptiles and birds have been rescued and relocated to safe areas.

A reforestation project with native species is also being conducted. To date, 565 hectares have been reforested in protected areas of the country. The project, conducted in coordination with ANAM and the Panama Aquatic Resources Authority (ARAP), includes the provinces of Colon, Panama, Coclé, Herrera and Chiriquí.

Additionally, by April 2011, the ACP had paid Panama's

National Environmental Authority (ANAM) and Aquatic Resources Authority (ARAP), a total of \$3,581,234.00 as ecological compensation.

## Paleontology and Archaeology Research

The Panama Canal works hand in hand with the Smithsonian Tropical Research Institute (STRI) in the location and study of paleontological findings from the Third Set of Locks construction site.



Fossil of a crab found in the Atlantic locks excavation area

Location of reforestation projects



1. Volcan Baru National Park - 30 has
2. Chiriquí Viejo River mangrove - 50 has
3. Forest Research Center - 100 has
4. El Montuoso Forest Reserve - 50 has
5. Omar Torrijos National Park - 150 has
6. Altos de Campana National Park - 30 has
7. Camino de Cruces National Park - 115 has
8. Chagres National - 40 has

As the program progresses, archaeological findings removed from expansion areas continue to be assessed. The list of findings includes arrows dating back from the pre-Colombian era, bottles from the beginning of the 20th century and a dagger, believed to have been of common use between 1590 and 1610, among other objects.



Monitoring reforestation projects in Coclé



Field audit at the Atlantic dredging project

## Accountability

Fulfilling its responsibility of providing information about the Expansion Program, and in compliance with Law 28 of July 17, 2006, the Canal publishes quarterly reports on the progress achieved in the Program to the Executive Branch, the National Assembly, the Republic's Controller General, the Ad-hoc Committee (formed by members of the civil society) and the multilateral financing agencies. The contents of these reports are available in the Canal Internet page at [www.pancanal.com](http://www.pancanal.com) for public consultation.

The Expansion Program has also established a hotline (800-0714) and an e-mail address ([ampliacion@pancanal.com](mailto:ampliacion@pancanal.com)) to provide general information on the program as well as to respond to queries, complaints and suggestions related to the execution of the works.

The ACP has also established a strict environmental surveillance and monitoring program to guarantee compliance with the environmental commitments of the program.

Inspection conducted by ERM, the independent auditor



## Labor Aspects

The Panama Canal Expansion Program has irrefutably become a training opportunity for professionals in different fields, whom today boast new abilities they have put to work in the areas where the projects are conducted.

Training is a vital part of the commitment the Canal acquired back on October 22, 2006, when the Panamanian people approved the expansion. This process was made a reality thanks to the program undertaken by the National Institute for Professional Training and Human Development, which has contributed to meeting the labor demands of the Expansion Program and other local projects.

The men and women who become part of the team that is building the expanded Canal are gaining invaluable knowledge that helps them grow in their respective professional fields.

To date, the Expansion Program has created more than 14,000 jobs for Panamanians from different parts of the country since the beginning of the works in September 2007.

## Financing

To procure the required financing of \$2.3 billion to complete the expansion of the waterway, the Panama Canal Authority signed contracts with a group of bilateral and multilateral credit entities.

Upon receiving authorization by Panama's Cabinet Council, the Canal Board of Directors approved the signing of financial contracts with the following agencies:

Financial Agencies	
European Investment Bank (BEI)	\$ 500 million
Japan Bank for International Cooperation (JBIC)	\$ 800 million
Inter-American Development Bank (IDB)	\$ 400 million
International Financial Corporation (CFI)	\$ 300 million
Andean Development Corporation (CAF)	\$ 300 million
<b>Total</b>	<b>\$ 2,300 million</b>



Work under the Atlantic locks project



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