THIRD SET OF LOCKS
The project entails the construction of Neopanamax-dimension lock complexes on the Pacific and Atlantic sides. Each complex will feature three chambers, nine water-saving basins, a lateral filling and emptying system and rolling gates.

PACIFIC ACCESS CHANNEL
Executed in four phases, the project entails the dry excavation of some 50 million cubic meters of material along a 6.1-kilometer span. The main concept was the creation of a new access channel north of the Third Set of Locks on the Pacific side.

NAVIGATION CHANNEL IMPROVEMENTS
This component involves dredging of the Canal entrances in the Atlantic and Pacific oceans, as well as the existing navigation channels in Culebra Cut and Gatun Lake.

IMPROVEMENTS TO WATER SUPPLY
The work will enable raising Gatun Lake’s maximum operating level by 45 centimeters to improve Canal water supply and draft dependability.

1. Atlantic entrance dredging
2. New Atlantic locks
3. Gatun Lake
Work to expand the Panama Canal officially began on 3 September 2007 with dry excavations to create the channel that would link the Third Set of Locks on the Pacific side to Culebra Cut. This project was divided into four phases, and the first three have already been successfully completed. The fourth and last phase is currently under construction by contractor ICA-FCC-Meco.

A crucial part of this project involves the construction of a dam known as Borinquen 1E. The dam is located west of Pedro Miguel Locks. It measures 2.3 kilometers long and will allow the operation of the new channel nine meters above the existing level.

Construction of the dam initially implied the injection of a grout curtain to seal the rock bottom. Its construction consists of a rock embankment and impervious clay-core to separate the waters of Miraflores and Gatun lakes. Dry-excavation activities in this area have called for the clearing of 461 hectares contaminated with unexploded ordnance (UXO) left behind by the US military during its deployment in Panama Canal areas.

Construction of Borinquen 1E dam clay core was completed in June 2015. In July 2015 an excavation record of 1.5 million cubic meters of material was reached on the Pacific Access Channel phase four project, and flooding of the channel began in September 2015. The channel reached the level of Gatun Lake in November 2015, and due to requirements it was filled to its maximum level of 27.19 meters.
CULEBRA CUT AND GATUN LAKE

This project entails the removal of underwater material to deepen and widen the navigation channels in Gatun Lake and to deepen the navigation channel in Culebra Cut. Work in the Cut was completed at the end of 2012.

The contract was awarded to Belgian contractor Jan De Nul n.v. Dredging was conducted in a 13.8-kilometer extension to widen the existing Atlantic entrance to a minimum of 225 meters, as well as the north access channel to the new Agua Clara Locks to a minimum of 218 meters.

An option for further dredging up to 16.1 meters was executed, which represented an additional 2.3 million cubic meters of material.

The contractor deployed several dredges simultaneously along the area, including hopper dredge Filippo Brunelleschi and cutter-suction dredge Marco Polo.

Dredging operations concluded on 30 January 2013 with Neopanamax size dredge Charles Darwin removing the remaining shoals in the new expanded channel.

DREDGING

Dredging projects were conducted under the Expansion Program at both Canal ocean entrances, in Culebra Cut and across Gatun Lake, to guarantee the safe navigation of Neopanamax vessels along the route.

Projects at the Pacific and Atlantic entrances have already been completed.

ATLANTIC ENTRANCE
Awarded on 25 September 2009
Contract completed on 4 October 2013

Belgian company Dredging International Panama was responsible for the work, which consisted of widening the navigation channel on the Pacific entrance to a minimum of 225 meters and deepening it to 15.5 meters below mean low water springs, as well as partial construction of the south access to the Cocoli Locks.

World-renown high-tech, powerful equipment including dredges D’Artagnan, Vlaanderen XIX and Lange Wapper were used in the project.

PACIFIC ENTRANCE
Awarded on 7 April 2008
Contract completed on 31 July 2013

An option for further dredging up to 16.1 meters was executed, which represented an additional 2.3 million cubic meters of material.

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Projects at the Pacific and Atlantic entrances have already been completed.
In addition, this project includes the removal of the Pacific Access Channel north plug, which is expected to be completed by April 2016. Land-based drilling and blasting equipment and drilling and blasting barges Thor and Baru and mechanical dredges Alberto Aleman Zubieta and Rialto M. Christensen have been used in this activity.

On 15 January 2016, a 70-meter long, 120-meter wide, and 8-meter deep channel was opened to allow the passage of Belgian company Jan De Nul n.v. floating equipment to the intermediate plug. Drilling, blasting, excavation and dredging activities were required to open this channel, which was accomplished with ACP land-based drilling equipment from the Drilling and Blasting Section and the Alberto Aleman Zubieta dredge from the Dredging, Cranes and Tugboats Section.

The Dredging Division completed the modification activities on Fuel Dock in Gamboa using hydraulic dredge Mindi, mechanical dredge Rialto M. Christensen and cutter- suction dredge Quibian I.

The installation of 34 new navigational towers along the 38 kilometers of Gatun Lake, from Gamboa to the locks on the Atlantic side, was also completed. These towers, that will use LED- and PEL-type lights, will replace light houses, enhancing safe navigation at the waterway.

These improvements, in conjunction with the six towers that were built in the area of the new Pacific Access Channel, and whose objective is to guide the transit through the expanded Canal, will go into operation with the opening of the expansion.

**RAISING GATUN LAKE MAXIMUM OPERATING LEVEL**

This project consists in raising the maximum operating level of Gatun Lake from 26.7 to 27.1 meters, to improve Canal water supply. The project will enable additional water storage capacity for Gatun Lake by nearly 200 million cubic meters, which requires the modification of specific structures in Canal operating areas.

To this regard, all 14 Gatun spillway gates were extended to contain the new water level and two additional gates were fabricated at the Canal industrial dry dock.

Thirty-two hydraulic cylinders were replaced in 2014 with new units with capacity to operate Gatun and Pedro Miguel lock gates in semisubmerged conditions. Modifications to most Canal infrastructure has already been completed, except for ongoing work to the Gatun launch and tugboat dock.

The construction of a dock and shed for the Lagarterita community in Colon was completed in September 2015. Third-party modifications were concluded with the delivery of these works.
2007
3 September
Inaugural blast in Paraiso Hill marks the beginning of expansion works.

2008
9 December
The Panama Canal signs a contract with five multilateral and bilateral credit agencies for $2.3 billion to finance part of the Expansion cost.

2009
15 July
Awarding of the contract for the design and construction of the Third Set of Locks to consortium Grupo Unidos por el Canal. At a cost of $3.2 billion, this is the largest, most complex project under the expansion program.

2010
7 January
The contract for the fourth Pacific Access Channel dry-excavation phase was awarded for a total of $284.2 million. Consortium ICA-FCC-Meco is in charge of removing 26 million cubic meters of material and building a 2.3-kilometer long dam.

2011
5 June
Costa Rican contractor Constructora Mecol S.A. completed the third dry-excavation phase for the creation of the Pacific Access Channel that will link the Pacific lock and Culebra Cut. A total of 8 million cubic meters of material were removed.

2012
March
Belgian contractor Dredging International Panama S.A. finished dredging of four million cubic meters of material from reaches along the north end of the Gatun Lake navigation channel.

September
Completion of the process to extend 14 Gatun spillway gates, a key component to enable raising the level of Gatun Lake.

2013
April-June
Canal entrances on the Atlantic and Pacific sides were widened and deepened to allow transit by Neopanamax vessels. A total of 26 million cubic meters of material were dredged from those areas.

20 August
Arrival of the first four gates for the Third Set of Locks.
MILESTONES

2014

12 November
Arrival of the last four gates for the Third Set of Locks.

15 December
First gate to be inserted at the Atlantic-side Agua Clara Locks.

2015

19 January
First gate to be inserted at the Pacific-side Cocoli Locks.

28 April
All gates are placed in their recesses, valves and other electromechanical parts are being installed, water-saving basin walls are built and preparations are underway for the filling of Agua Clara Locks.

23 June
Cocoli, on the Pacific, and Agua Clara, on the Atlantic, were filled to test the movement of gates. The first operating tests of mechanical and electrical systems and positioning and speed sensors tests were conducted on the Atlantic side. Movement tests verify position, weight and buoyancy data.

2016

4 January
Dry-excavation works begin to remove the intermediate plug that separates the fourth-phase of the Pacific Access Channel from Cocoli Locks.

6 January
Last blasting performed to remove the Pacific north plug to connect the Pacific Access Channel to the new Cocoli Locks complex.

28 January
The Jan de Nul n.v. cutter and suction dredge Marco Polo entered the area of the intermediate plug. A total of 272,000 cubic meters of material will be removed. Once the intermediate plug is removed, Gatun Lake waters will flow on a permanent and continuous basis to the new Cocoli Locks.

August
Works to remove plugs began at both sites. Excavation works started at the south plug at Cocoli early in August 2015.

November
The fourth phase of the Pacific Access Channel (PAC4) reached the level of Gatun Lake. The consortium ICA-FCC-MECO monitored filling operations as well as the performance of Borinquen 1E dam, which separates the new channel from Miraflores Lake.

September
Excavation works to remove the north plug began at Agua Clara Locks. Remaining material was removed through dredging.

10 September
Flooding of the new channel that will link Culebra Cut and the Third Set of Locks at Cocoli as part of the fourth dry-excavation phase of the Pacific Access Channel (PAC4).

October
Valves were adjusted to equalize the chambers.

272,000 cubic meters of material were dredged during the dry-excavation phase of the Pacific Access Channel (PAC4). The Jan de Nul n.v. cutter and suction dredge Marco Polo entered the area of the intermediate plug. A total of 272,000 cubic meters of material will be removed. Once the intermediate plug is removed, Gatun Lake waters will flow on a permanent and continuous basis to the new Cocoli Locks complex.

30 June
Remaining material was removed and flap gates were placed in position as part of the permanent-concrete pouring for the north entrance to the Pacific Access Channel.

12 November
Arrival of the last four gates for the Third Set of Locks.

15 December
First gate to be inserted at the Atlantic-side Agua Clara Locks.

2014

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30 June
Remaining material was removed and flap gates were placed in position as part of the permanent-concrete pouring for the north entrance to the Pacific Access Channel.
At a cost of $3.2 billion, the contract is executed by consortium Grupo Unidos por el Canal S.A. (GUPCSA). The consortium is formed by Sacyr Vallehermoso S.A. from Spain; Impregilo SpA, from Italy; Jan de Nul n.v., from Belgium, and Constructora Urbana, S.A. from Panama.

The project entails the design and construction of two similar lock complexes, one on the Pacific and the other on the Atlantic side. Each will have three chambers, nine water-saving basins, a lateral filling and emptying system and a redundant system of rolling gates.

To build the new locks, the contractor installed industrial parks at each site for concrete and aggregate production. The rock extracted from the Pacific site excavations, known as basalt, was used as aggregate and sand for concrete mixes at both sites.

The design of the Third Set of Locks, as well as the fabrication of its different components, are developed worldwide. In Italy, Cimolai SpA fabricated the 16 gates that were shipped to Panama and have already been placed inside their respective recesses at both lock-construction sites. South Korean-based Hyundai Samho Heavy Industries fabricated 158 valves, 84 bulkheads and 328 trash racks.

Overall electromechanical activities in both sites include the preparation, fabrication, installation and commissioning. First-stage embeddings for valves, bulkheads, capstans, bollards, heavy-duty bolts for the fendering system, corner border protection, track way for culvert isolation bulkheads, end stoppers, seismic hooks and maintenance supports for gates, as well as grounding conductors have also been installed. Installation of second stage embeddings for culvert isolation bulkheads, bulkheads, and culvert and equalization valves has been completed in all eight lock heads and wet testing is pending. Valves are undergoing a series of technical testing to verify their optimum performance.

Once lock chambers at both sites were filled, an operating testing process began for Agua Clara Locks gate number 8 on the Atlantic side. This process was conducted for all gates that are part of the Third Set of Locks.

During this phase, the performance of all driving mechanisms was assessed, overseen and adjusted, bringing us closer to the opening of the expanded Canal.
The rolling gates system is one of the most significant elements of the locks design and construction, at a cost of $547.7 million, which includes fabrication, shipment and installation. Each gate will open and close in four and not more than five minutes.

The six different types of gates were fabricated with features that vary according to where they will be installed. For instance, the tallest ones – 33.04 meters – will be installed at the Pacific entrance to the Canal, to withstand significant tidal variation. Even though the heaviest gates are 4,242 tons, their design incorporates buoyancy chambers to enable them to move on rails at a mere 15 percent of their actual weight.

The unloading and installation of the gates were conducted using special transportation vehicles, which look like huge skateboards with hundreds of wheels and are remotely operated. The gates were inserted in dry and will be commissioned once the lock complexes are flooded, which reduced the time required for the installation of mechanical elements.

The gates for the Pacific site were shipped from the staging area on the Atlantic side in July 2014, in preparation for their insertion in the recesses.

On 15 December 2014 the insertion phase of the first gates began at the Agua Clara Locks and concluded on 1 April 2015. At the Pacific site, this activity began on 19 January 2015 and concluded on 28 April 2015.

The contractor installed all valves and continue working on machinery buildings from where both sites will be operated. Chambers were flooded to run operating tests on gates. Agua Clara Locks gate number 8 was the first to be tested, continuing with the other seven, and then with Pacific lock gates. Water-saving basins are ready and filling tests are being conducted at Agua Clara and Cocoli.

Dry-excavation works to remove the intermediate plug began on 4 January 2016 and the Jan de Nul n.v. cutter and suction dredge Marco Polo entered the area of the intermediate plug on 28 January 2016. A total of 272,000 cubic meters of material will be removed. Once the intermediate plug is removed, Gatun Lake waters will flow on a permanent and continuous basis to the new Cocoli Locks.

Construction of machinery buildings is progressing and over 4 million cubic meters of concrete have been poured.

GUPCSA started and concluded reinforcement works on concrete sills on both the Atlantic and the Pacific sites. Currently, control systems on both sites are being integrated to guarantee and ensure the operation of the new locks.
Expansion Program environmental activities continue to be coordinated with contractors and government institutions like the Ministry for the Environment (MiAmbiente) and the Panama Aquatic Resources Authority (ARAP).

To date, more than 6,000 mammals, birds, reptiles and amphibians have been rescued and relocated. As part of the ecological compensation, reforestation projects have also continued in 937 hectares using native species – two hectares for each hectare required for the Expansion Program.

The projects are conducted in national parks within city limits and the eastern side of the capital city in Camino de Cruces National Park and the Tapagra Hydro-Protection Zone in Chepo, as well as in the Chiriqui province and in areas in the Cocle and Herrera provinces. Additionally, a project is executed in the MiAmbiente Forest Research Center and other two in mangrove areas in Chiriqui Viejo and Chame Bay. Several reforestation projects were completed during 2015 including 50 hectares at the El Montuoso Forest Reserve and other 50 hectares at the Forest Research Center. Additionally, the 50-hectare mangrove reforestation project at the mouth of the Chiriqui Viejo River was also completed, being this the fist reforestation project using red mangrove, tea mangrove and white mangrove.

To date, reforestation projects have covered 565 hectares divided into 11 different projects along the country, with 182 hectares in the maintenance phase. Beyond a new landscaping, the final contribution is the positive impact on the lives of hundreds of Panamanians who received economic benefits for their work and who are now entrepreneurs – people with the knowledge to start their own business.

While some projects are nearing completion, others that are starting are setting the pace by reaching to indigenous areas under the agroforestry system, with a mixture of fruit-bearing and timber trees, medicinal plants and agricultural crops. That is the case of the 42 hectares in the area of Wacuco No. 1, at the indigenous Guna region of Madungandi. In addition, 65 hectares of native species were established in Soberania National Park and 83 hectares will be reforested in the Embera community of Arimae, in the Darien province, under the agroforestry system.

Other reforestation projects have to be established in about 305 hectares in areas that MiAmbiente has to identify. To date, the ACP has paid MiAmbiente and ARAP a total of B/.4,120,120.20 as ecological compensation.

As part of the efforts to preserve the cultural patrimony, highly-valuable archaeological items, such as a 16th-Century Spanish dagger, pre-Colombian arrowheads and bottles dating from last century have been recovered from excavation sites.

A contract for paleontological research signed by the Panama Canal Authority with the Smithsonian Tropical Research Institute (STRI) concluded at the end of 2012. As a result of the work conducted by STRI, 8,862 items were collected and catalogued, of which 5,377 are rock and sediments, and 3,485 are fossils.
LABOR PROMOTION

The Expansion Program has been a significant source of job opportunities and training for professionals in different fields, producing more than 40 thousand direct jobs since its beginning in 2007.

To provide general information and tend to queries, complaints, and suggestions related to the execution of the work, the program established hotline 800-0714 and electronic e-mail account ampliacion@pancanal.com.

<table>
<thead>
<tr>
<th>Direct jobs</th>
<th>Cumulative jobs</th>
<th>Active jobs</th>
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<td>Contractors and Subcontractors</td>
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<td>Panama Canal</td>
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FINANCING

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

The total credited amount has been disbursed to date.

| FINANCING |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Japan Bank for International Cooperation (JBIC) | $800 millions |
| European Investment Bank (BEI) | $500 millions |
| Inter-American Development Bank (BID) | $400 millions |
| International Financial Corporation (CFI) | $300 millions |
| Latin American Development Bank (CAF) | $300 millions |
| Total | B/. 2.3 billions |

A view of Agua Clara Locks buildings on the Atlantic side.