Technical Analysis to Deepen Gatun Lake and Gaillard Cut to Design Channel Bottom of 27.5’ PLD

Análisis técnico para profundizar el lago Gatún y el Corte Culebra para el diseño del fondo del Canal de 27.5' PLD

ACP

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Descripción y Resumen
(No existe Resumen Ejecutivo)

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Autoridad del Canal de Panamá
Dredging Division and Canal Capacity Projects Division
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GENERAL DESCRIPTION OF THE STUDY

The study consists of deepening the Panama Canal navigation channel through Gatun Lake and Gaillard Cut, and is a major component of the Panama Canal Expansion Study, an investigation into the possibility of accommodating ships with deeper and wider beam than the current Panamax size through the Panama Canal. The deepening study investigates the following activities:

a. Initial dredging:	From 37' PLD to 34' PLD
b. Drilling & blasting:	From 34' to 19.5' PLD
c. Final dredging:	From 34' to 27.5' PLD

The Gantt chart in Appendix No. 1 shows the sequence of these activities.

The initial dredging to 34' PLD and drilling & blasting to 19.5' PLD will be executed almost simultaneously, with the drilling & blasting lagging behind the initial dredging by a couple of months. The approved and ongoing project to deepen the navigation channel through Gatun Lake and Gaillard Cut to 34' PLD already covers the initial dredging to elevation 34' PLD, and drilling and blasting to elevation 19.5' PLD.

The deepening from elevation 37' to 34' PLD is a water project as it augments Gatun Lake water capacity by lowering the lake minimum operation level from elevation 81.5' to 78.5' PLD without affecting Panamax ships maximum transiting draft of 39.5'. After the deepening, 362.8 million cubic meters of additional water would be available, that is, about 5.6 lockages per day. Each lockage represents 55 million gallons of water.

The new design channel bottom of 34' PLD will also serve as an alternative under the Canal expansion program by raising Gatun Lake level minimum operation level to elevation 85' PLD, which will allow the traffic of Post-Panamax and Panamax vessels loaded to 45' draft. Refer to Appendix No. 17 for a draft phase sketch. However, this draft phase alternative will diminish lake water availability. Therefore, further deepening of Gatun Lake to elevation 27.5' PLD or other alternatives such as the creation of new water reservoirs represent options to increase water availability.

Although it is only required to drill and blast to elevation 26' PLD for subsequent dredging to a design channel bottom at elevation 34' PLD, it was decided to drill & blast to elevation 19.5' PLD so channel bottom material would be fragmented and ready for future dredging operations. Also, drilling & blasting is usually the critical path of any dredging operation, and its execution in just one phase comparing to two phases is more effective and efficient in terms of cost, production, and less interruption for existing Canal traffic.

During the initial dredging, dredges will be the forward team to dredge all the previously drilled and blasted material to a design bottom of 34' PLD. Then drilling and blasting will follow to fragment the high hard points, that dredges were not be able to remove, to elevation 19.5' PLD. After fragmentation, the dredges will proceed to remove the material and obtain a design channel bottom of 34' PLD. Finally, if Canal Expansion Program becomes effective, the dredges could begin dredging to a design bottom of 27.5' PLD.

SUMMARY

a. In summary, the total dredging and excavation volume, time frame and costs of deepening Gatun Lake and Gaillard Cut **without any contingency factor** are as follows:

SUMMARY OF VOLUME, AREAS, DURATION, AND COSTS FOR DEEPENING GATUN LAKE AND GAILLARD CUT TO DESIGN CHANNEL BOTTOM OF 27.5' PLD

	Volume or area	Equipment Qty	Duration (years)	Cost ($)
Dredging from 37' to 32' PLD	7,102,594 m^3	2 dredges	4.25	84,409,211
Drilling and blasting from 34' to 19.5' PLD	5,750,877 m^2	2 drill-boats	10.30	210,739,668
Dredging from 32' to 25.5' PLD	19,436,543 m^3	3 dredges	8.00	235,723,606
Dry excavation to 25.5' PLD	6,675,713 m^3	Contractors	6.50	27,902,852
TOTAL COST ONE PHASE D&B				**558,775,337**

b. If it is decided to drill and blast just for a design channel bottom of 34' PLD, that is drilling to 26' PLD instead of going directly to 19.5' PLD for future dredging, the total cost for dredging to a design channel bottom of 27.5' PLD could increase up to 11% as shown in the following table:

DEEPENING GATUN LAKE AND GAILLARD CUT TO 27.5' PLD CHANNEL BOTTOM

Design Channel Bottom	34' PLD	27.5' PLD	TOTAL
Dredging Volume (m3)	7,102,594	19,436,543	26,539,137
Drilling & Blasting areas (m2)	3,033,544	5,750,877	5,750,877
Duration (years)	6	8.5	11.5
Dry excavation (m3)	0	6,675,713	6,675,713
TOTAL COST, ONE - PHASE D&B ($)	**163,564,425**	**395,210,912**	**558,775,337**
TOTAL COST, TWO - PHASE D&B ($)	**163,564,425**	**455,718,784**	**619,283,209**

Notes:
1. D&B cost from 34' to 19.5' PLD is $ 210.7 M.
2. D&B cost from 34' to 26' PLD is $ 79.2 M, and from 32' to 19.5' PLD is $192.1 M.

c. Appendix No. 5 contains the estimate for drilling and blasting to 26'PLD for a design channel bottom of 34' PLD; and from 32' to 19.5' PLD for a design channel bottom of 27.5' PLD.