

# CHICKAMAUGA LOCK REPLACEMENT PROJECT BRIEF INLAND WATERWAYS USERS BOARD

28 Feb 2018

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Nashville District



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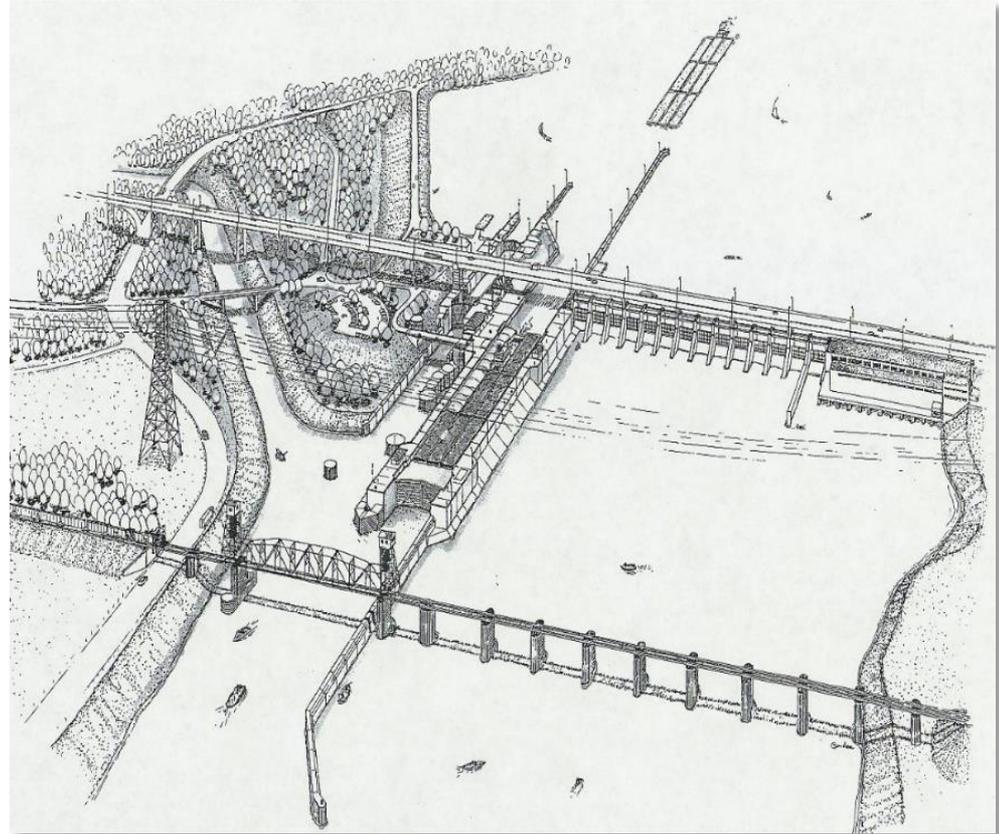


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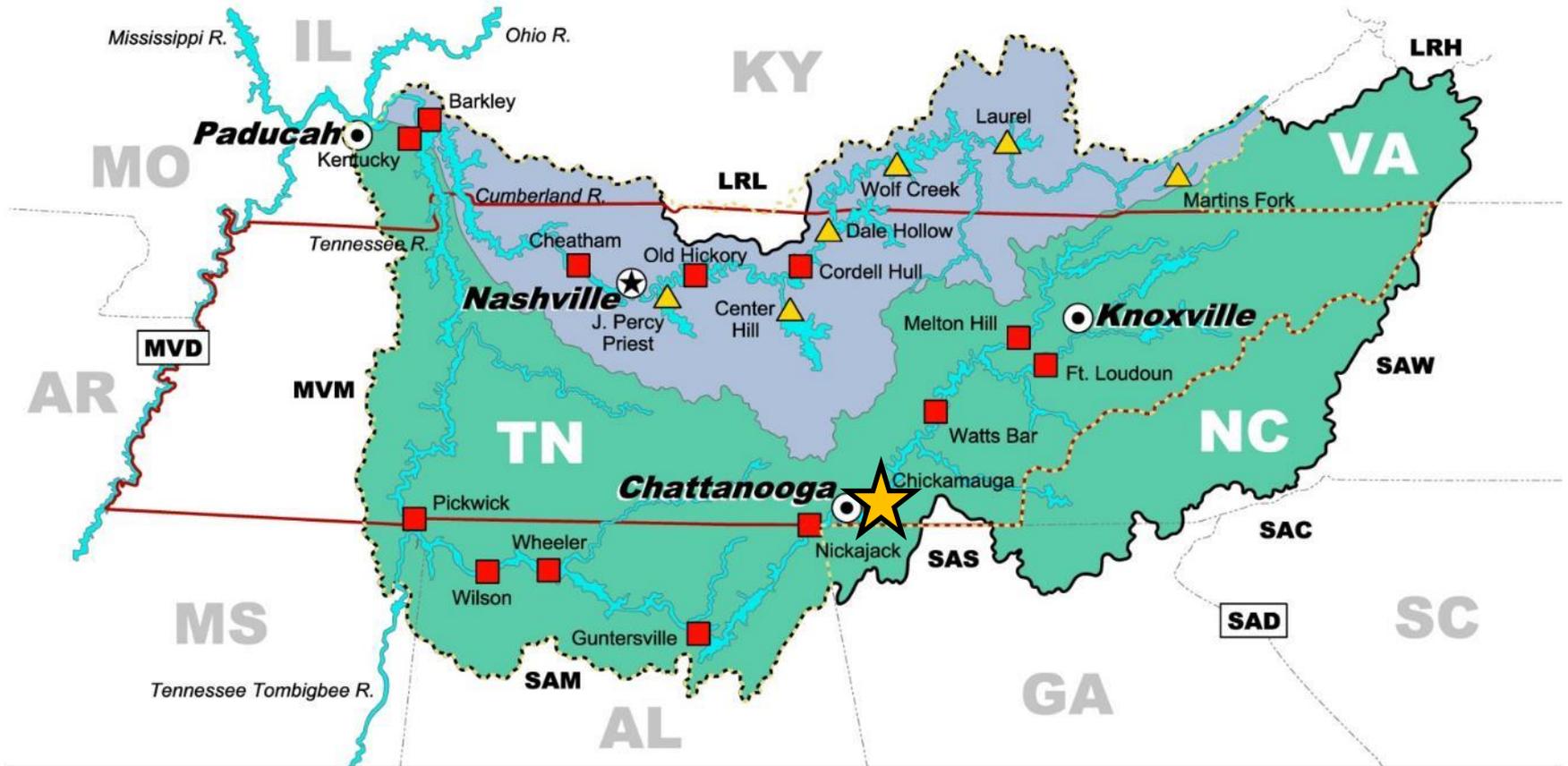
# CHICKAMAUGA LOCK REPLACEMENT

- **Project Briefing:**
  - Existing Lock
  - Economics & Funding
  - Construction Status
  - Lock Chamber Contract
- **Site Visit**
  - Existing Lock
  - Replacement Lock Construction



# NASHVILLE DISTRICT AREA OF RESPONSIBILITY

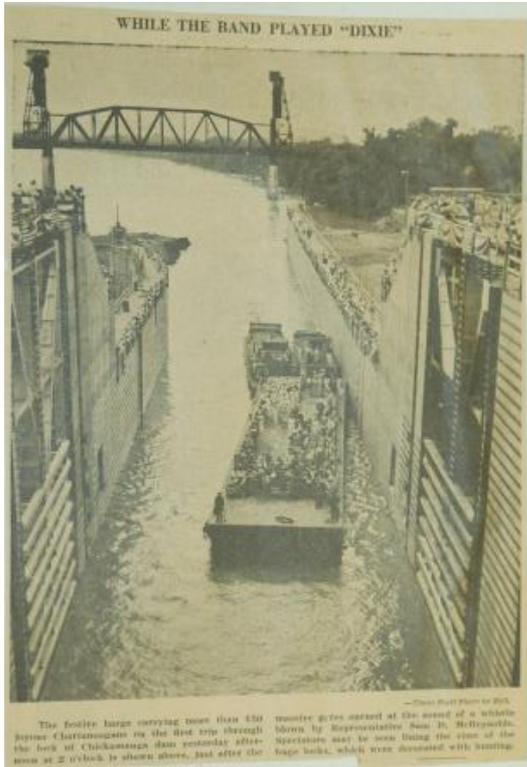
## TENNESSEE AND CUMBERLAND RIVER NAVIGATION SYSTEMS



- Lock & Dam
- Cumberland River Basin
- Regulatory Boundary
- Civil Works Boundary
- ▲ Dam
- Tennessee River Basin
- Emergency Management Boundary

# CHICKAMAUGA LOCK

- TVA's Chickamauga Lock and Dam was dedicated by FDR in 1940.



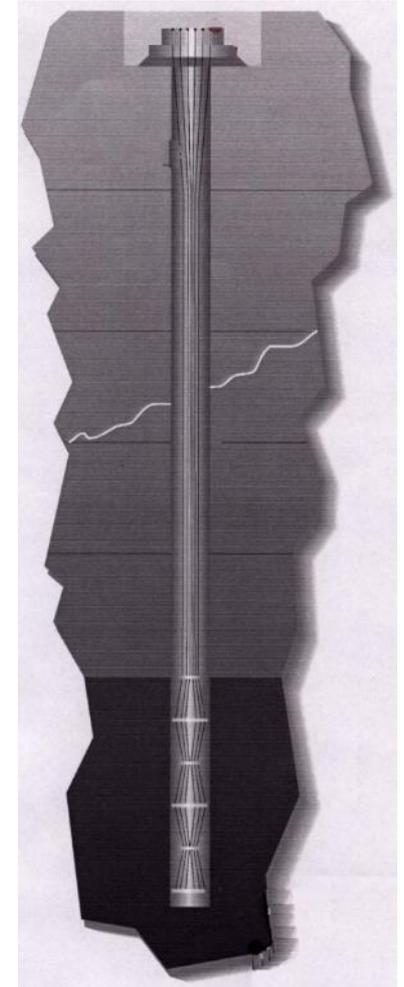
- Concrete growth due to Alkali-Aggregate Reaction (AAR) was noted early in the project life.

Lock has “grown” to be 12 inches longer and 4 inches taller, since its construction in 1940.



# EXISTING LOCK - MAJOR MAINTENANCE

- Post-Tension Anchoring
- Miter Gate Anchor Bar Rehab
- Highway Bridge Bearing Reset
- Concrete Resurfacing
- Floating Mooring Bitt Embeds

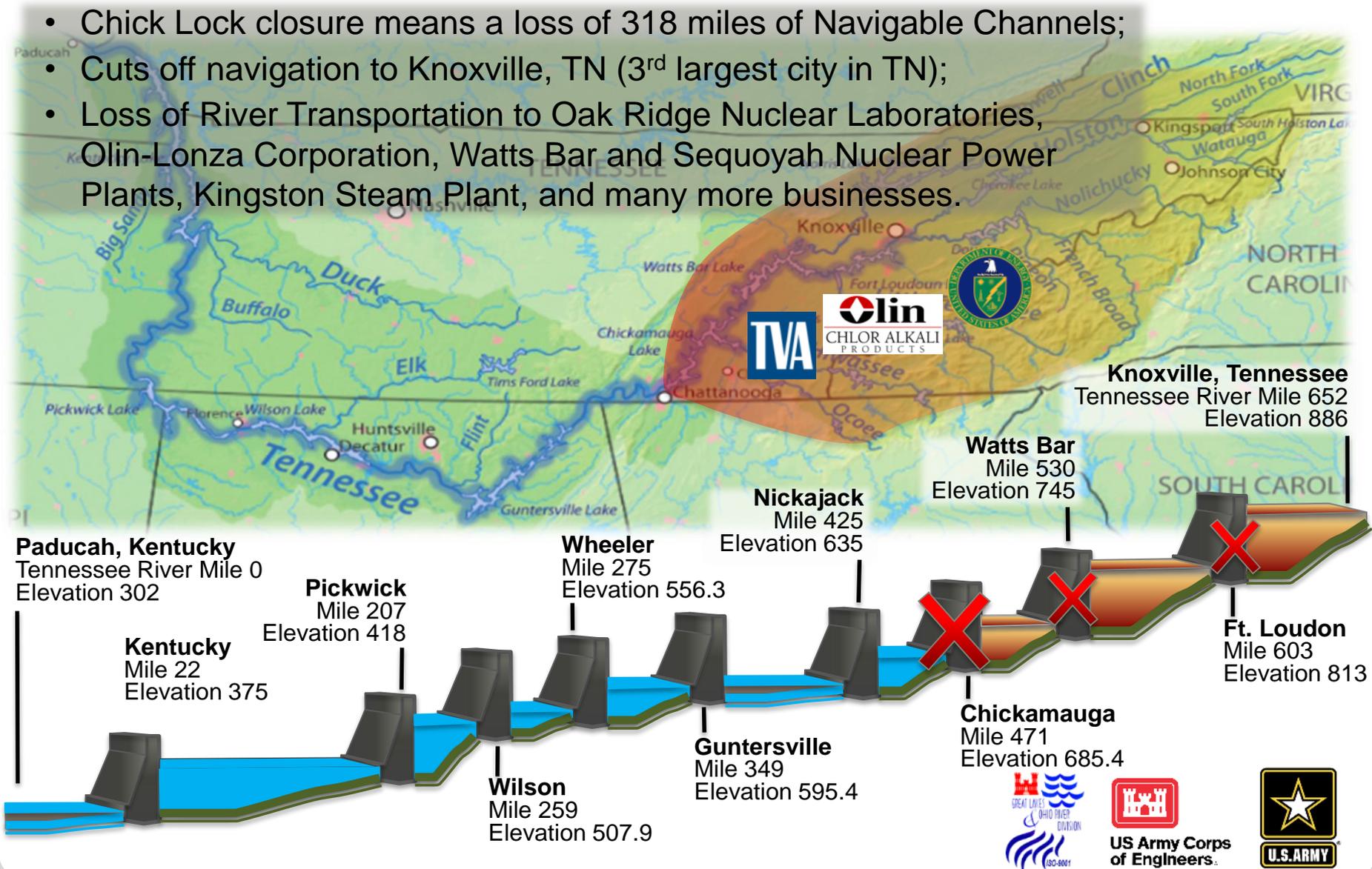


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# UPSTREAM IMPACTS OF LOCK CLOSURE

- Chick Lock closure means a loss of 318 miles of Navigable Channels;
- Cuts off navigation to Knoxville, TN (3<sup>rd</sup> largest city in TN);
- Loss of River Transportation to Oak Ridge Nuclear Laboratories, Olin-Lonza Corporation, Watts Bar and Sequoyah Nuclear Power Plants, Kingston Steam Plant, and many more businesses.



# Chickamauga Lock Replacement



- New 110 ft x 600 ft lock will pass 9 barges per lockage as opposed to the existing 60 ft x 360 ft lock's 1 barge per lockage.
- Replacement lock could reduce commercial transit times by 80%.
- Chickamauga is the most active lock on the Tennessee River for recreational vessels (Over 3,000 vessel lockages per year).

# CHICKAMAUGA LOCK – PROJECT ECONOMICS

- Total Project Estimated Cost: \$760.3M (October 2017 Price Level)
- Expended through Dec 2017: \$203.5M (26% complete).
- Earliest Possible Completion Date: 2024 (with efficient annual funding)

Discount Rate	Benefit to Cost Ratio	Remaining Benefit to Remaining Cost Ratio
7% (OMB)	1.0	1.5
2.75% (FY18 Rate)	1.7	2.5

- **Average Annual Benefits = \$48.3M.**
- Like many inland navigation projects, Chickamauga is not currently eligible for the President’s Budget due to Benefit - Cost Ratio requirements.
- **Temporary suspension of construction activities from 2013 – 2015,** due to funding constraints.
- Project returned to funding stream through Corps of Engineers Work Plans or “Funding Pots”: **FY15 = \$3.0M**



# CHICKAMAUGA LOCK EFFICIENT FUNDING

- FY16 = \$29.9M (Efficient Funding Received)
  - Lock Excavation Contract Award
- FY17 – \$40M (Efficient Funding Received)
  - Exercise Remaining Options for Lock Excavation Contract
  - Award Lock Chamber Contract
- FY18 – \$78M
  - Exercise Options for Lock Chamber Contract
- FY19 – \$99.5M
  - Exercise Options for Lock Chamber Contract
- FY20 – \$91M
  - Exercise Options for Lock Chamber Contract
  - Award Decommissioning & Site Work Contract



# Chickamauga Lock Project Time and Cost Scorecard



## Expenditures 31 Dec

Planned (BCWS) \$210.5M  
 Earned (BCWP) \$203.2M  
 Actual (ACWP) \$203.5M

**BCWP:** Reports the value (based on % complete) of the work performed to date.

**Target:**  
 Actual as compared to Planned: (<1% = Green)  
 (>1% and <3% = Yellow) and (>3% = Red)

## Schedule 31 Dec

(Baseline)/(Current)

Project Complete May 2028 / Jun 2024  
 Lock Operational Nov 2027 / Dec 2023

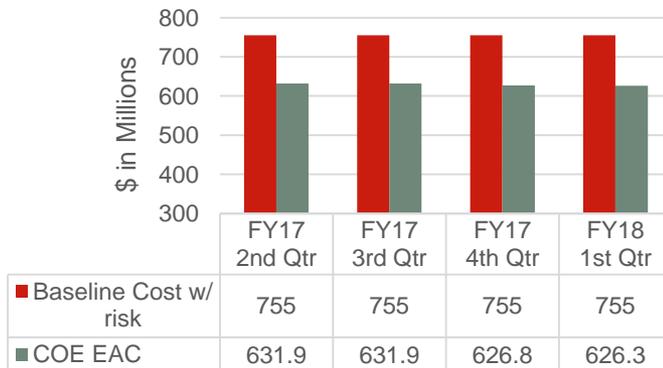


**Measures:** Planned project completion and Lock operational dates

**Target:** PACR Anticipated in FY18.

## Budget

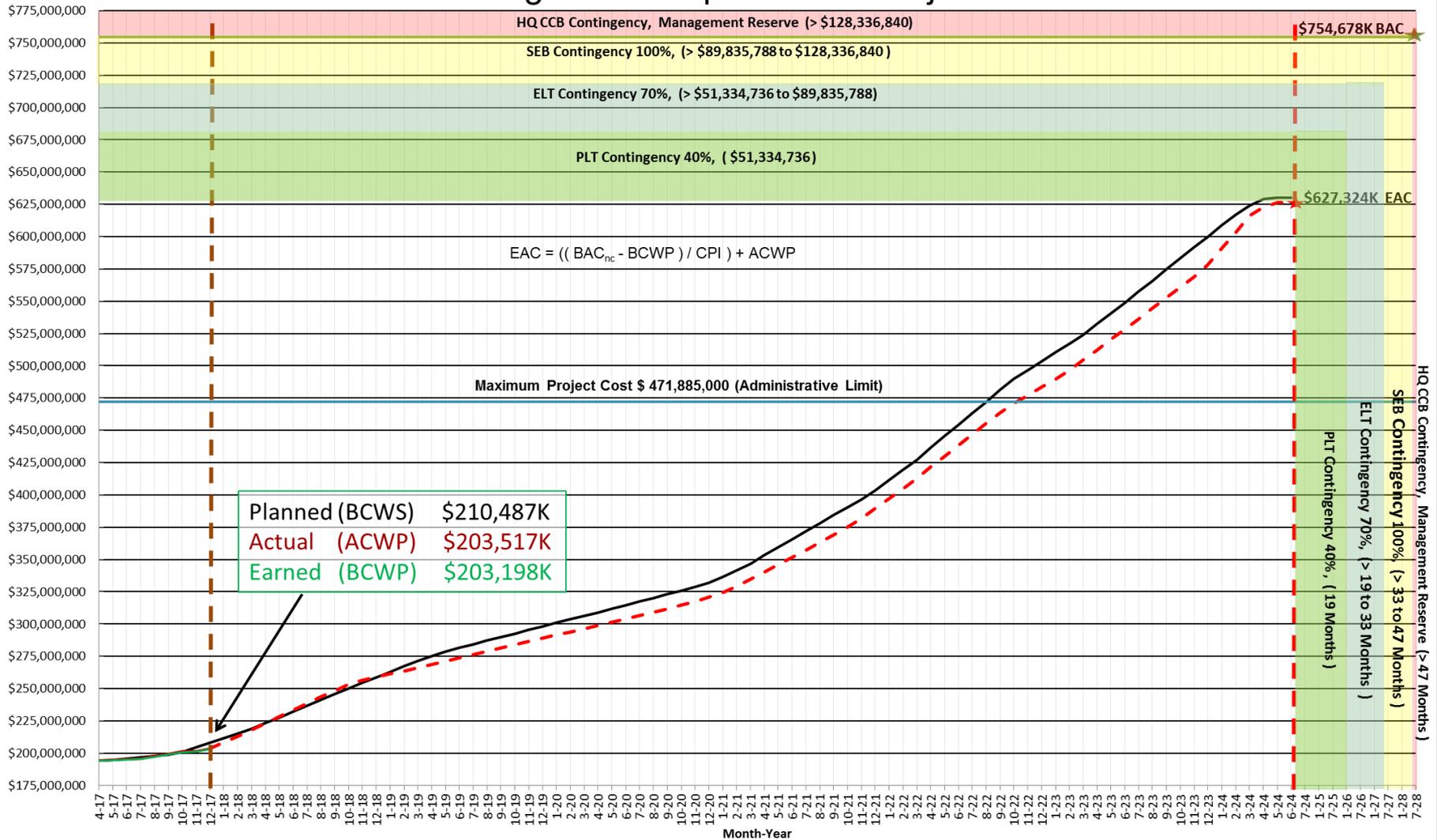
Chickamauga Project EAC Trend



## Major Activity Schedule

Activity	Baseline	Current
Lock Excavation – Complete Rock Anchors	27 Feb 2018	21 Mar 2018
Lock Excavation – Complete Secant Pile Wall	19 Apr 2018	14 Jun 2018
Lock Chamber – Start Batch Plant Construction	15 May 2018	15 May 2018

# Chickamauga Lock Replacement Project S Curve



# POST AUTHORIZATION CHANGE REPORT (PACR)

Total Project Cost Exceeds 902 Limit

- **\$755M > \$482M (Oct 2016 \$'s)**

Allocations will exceed 902 limit ~ FY2020

- Assuming efficient annual funding

Developing PACR documents

- PACR Package to LRD: 28 February 2018
- PACR Package to HQ: May 2018
- Goal: Complete prior to next WRDA

PACR based on 2016 Certified Total Project Cost Estimate

- Estimates updated every 2 years (scheduled for June 2018).

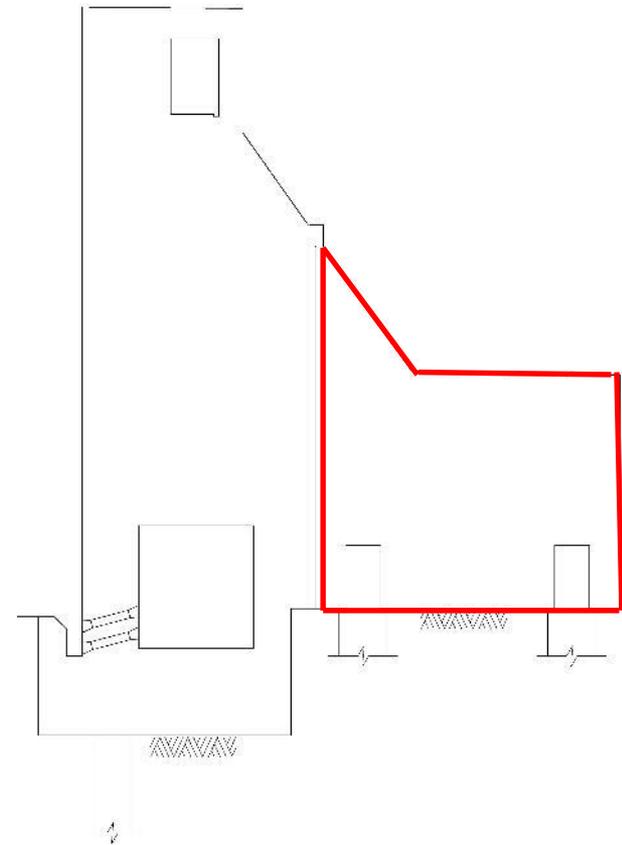


# CHICKAMAUGA LOCK REPLACEMENT PROJECT OVERVIEW



# CHICKAMAUGA LOCK - COFFERDAM

(LAST CONSTRUCTION PRIOR TO TEMP SUSPENSION OF WORK IN 2012)



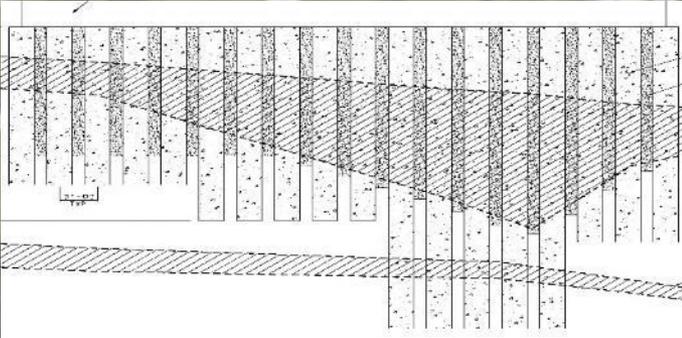
Innovative use of land wall in cofferdam  
keeps existing lock open to traffic.



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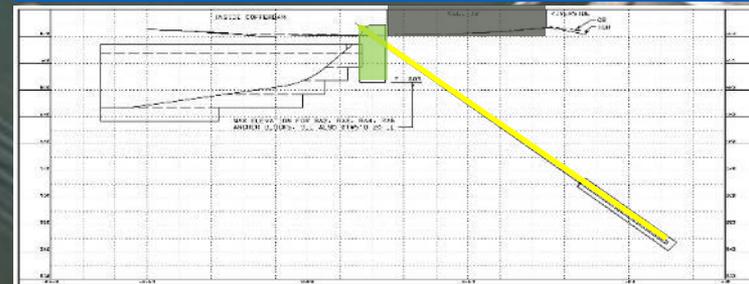
# Lock Excavation Construction Contract



51' Long Secant Pile Ret. Wall

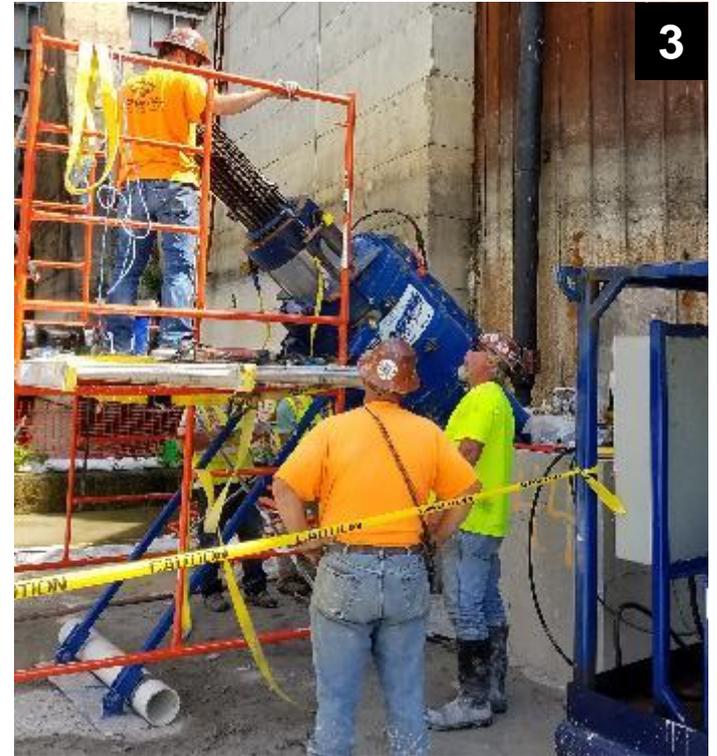
Rock Excavation

44 Inclined Rock Strand Anchors



- Contract Award Sep 2016 – \$33.5M
- Scheduled completion date - Nov 2018

# LOCK EXCAVATION – ROCK ANCHOR INSTALLATION



# LOCK EXCAVATION CONTRACT - OCTOBER 2017

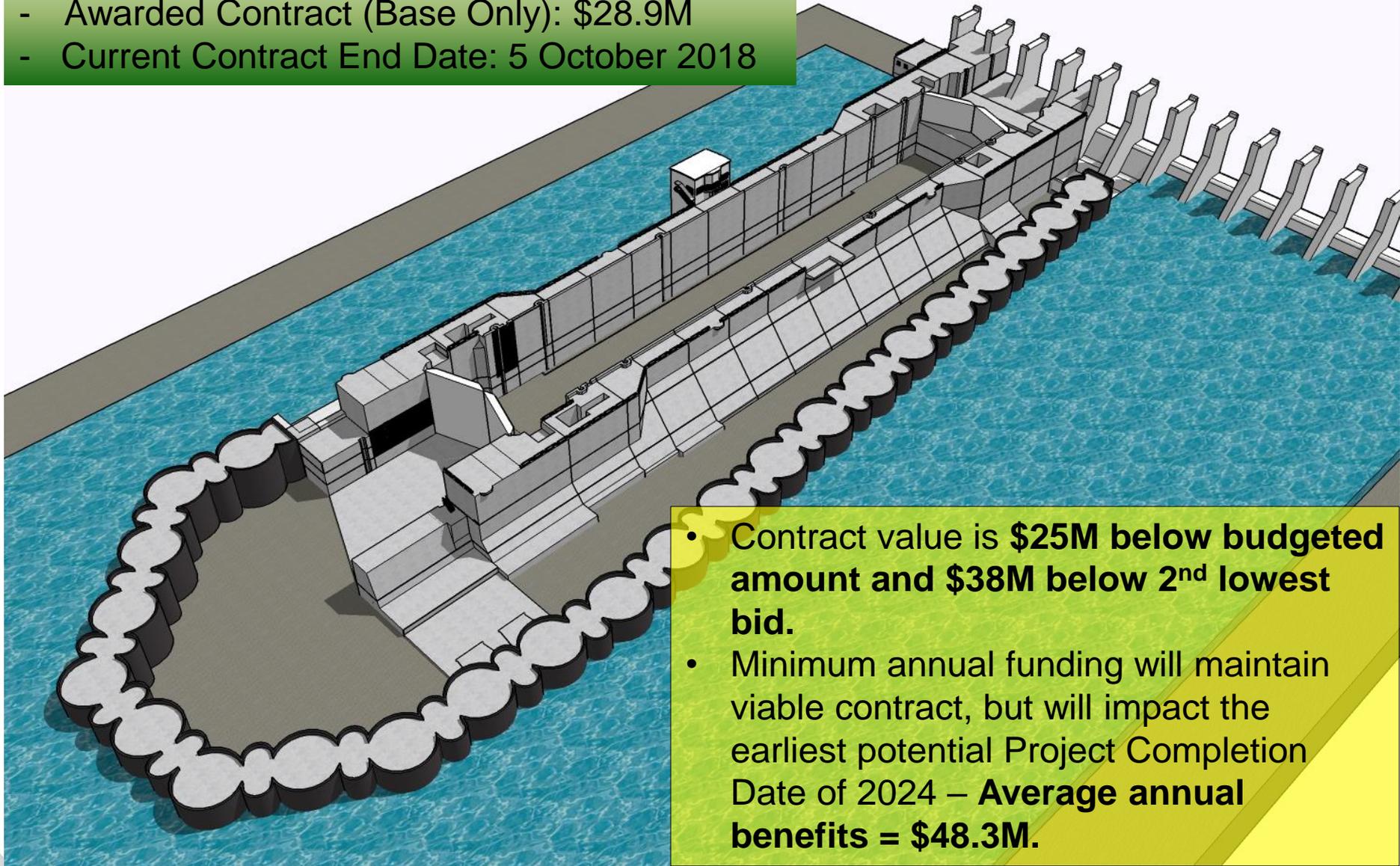


# LOCK EXCAVATION CONTRACT - JANUARY 2018



# Lock Chamber Construction Contract

- Total Value (Base and 13 Options) = \$240M
- Awarded Contract (Base Only): \$28.9M
- Current Contract End Date: 5 October 2018



- Contract value is **\$25M below budgeted amount and \$38M below 2<sup>nd</sup> lowest bid.**
- Minimum annual funding will maintain viable contract, but will impact the earliest potential Project Completion Date of 2024 – **Average annual benefits = \$48.3M.**

# LOCK CHAMBER CONTRACT – OPTION DATA

Contract Option	Contract Amount (Millions)	Contract Admin & Contingency (Millions)	Total Amount (Millions)	Option Expiration Date
Option 1	\$ 25.9	\$ 5.9	\$ 31.8	30-Sep-2018
Option 2	\$ 13.8	\$ 3.6	\$ 17.4	30-Sep-2018
Option 3	\$ 14.6	\$ 2.8	\$ 17.4	30-Sep-2019
Option 4	\$ 17.9	\$ 3.4	\$ 21.3	30-Sep-2020
Option 5	\$ 11.6	\$ 2.2	\$ 13.8	30-Sep-2020
Option 6	\$ 18.0	\$ 3.4	\$ 21.4	30-Sep-2021
Option 7	\$ 7.7	\$ 1.5	\$ 9.2	30-Sep-2021
Option 8	\$ 15.9	\$ 3.0	\$ 18.9	30-Sep-2021
Option 9	\$ 31.8	\$ 5.0	\$ 36.8	30-Sep-2022
Option 10	\$ 20.6	\$ 3.9	\$ 24.5	30-Sep-2022
Option 11	\$ 30.7	\$ 4.8	\$ 35.5	30-Sep-2022
Option 12	\$ 2.6	\$ 0.5	\$ 3.1	30-Sep-2022
Option 13	\$ 0.2	\$ 0.1	\$ 0.3	30-May-2023

Note: Options may not be exercised sequentially.



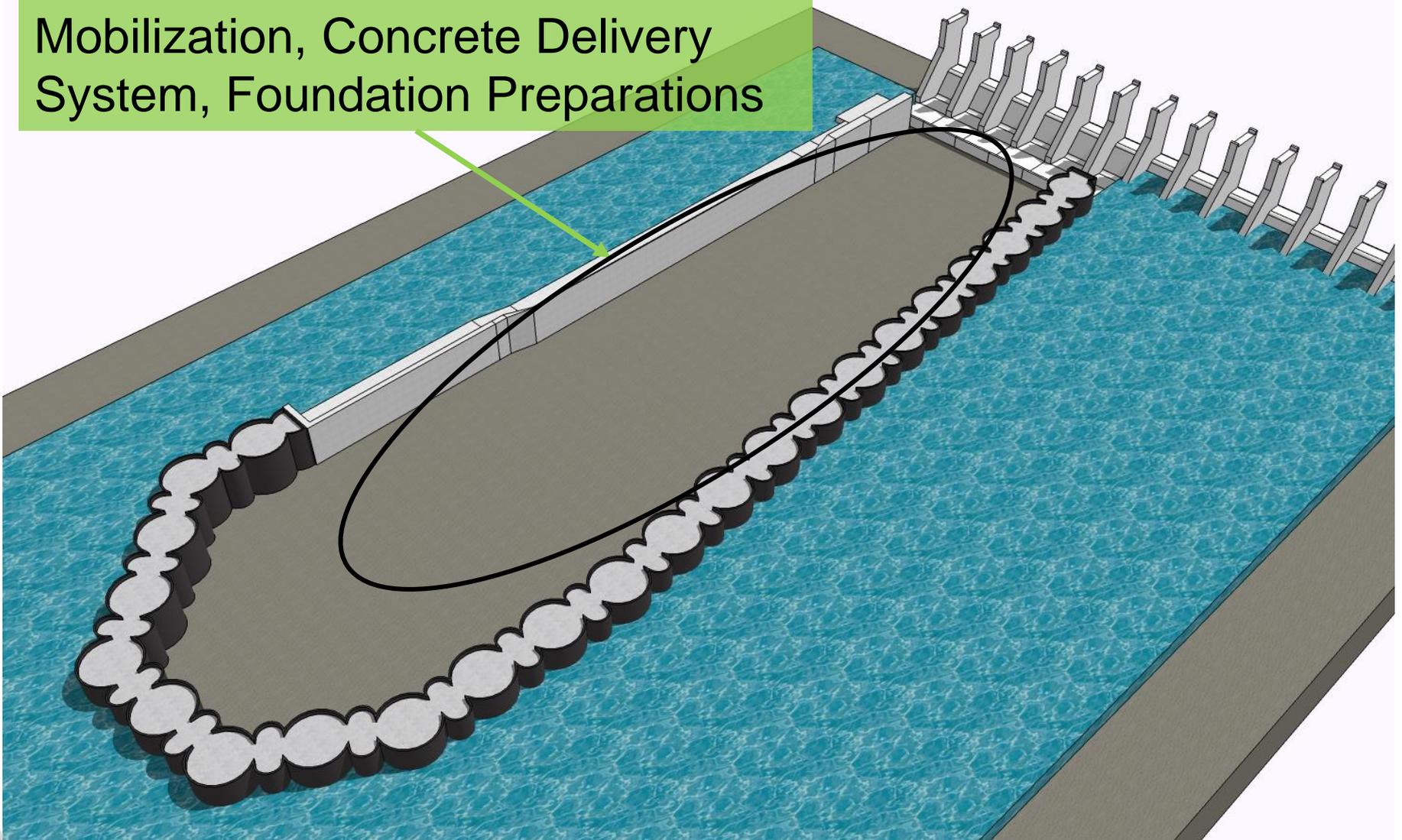
# LOCK CHAMBER CONTRACT EFFICIENT VS MINIMAL FUNDING

Fiscal Year	Efficient Funding			Efficient Funding Activities	Minimum Required Funding to Continue Lock Chamber Contract to Completion <sup>1</sup> (millions)	Minimum Funding Activities
	Contracts (millions)	Admin & Contingency (millions)	Total (millions)			
2018	66.0	12.0	\$78.0	1) Lock Chamber - Exercise Options; 2) S&A, EDC, and PM activities for 1.	\$49.2	Includes exercising Options 1 and 2 plus contract admin and contingency funding. Minimum amount will maintain a viable Lock Chamber contract, but will impact project's critical path.
2019	91.3	8.2	\$99.5	1) Lock Chamber - Exercise Options; 2) S&A, EDC, and PM activities for 1.	\$73.9	Includes exercising Options 3-6 plus contract admin and contingency funding. Minimum amount will maintain a viable Lock Chamber contract, but will impact project's critical path.
2020	82.2	8.8	\$91.0	1) Lock Chamber - Exercise Options; 2) Site Work and Decommission - Award Base Contract; 3) S&A, EDC, and PM activities for 1 and 2.	\$64.9	Includes exercising Options 7-9 plus contract admin and contingency funding. Minimum amount will maintain a viable Lock Chamber contract, but will impact project's critical path by not awarding the Site Work and Decommissioning Contract.
2021	81.8	9.2	\$91.0	1) Lock Chamber - Exercise Options; 2) Site Work and Decommission - Exercise Options; 3) Approach Walls - Award Base Contract; 4) S&A, EDC, and PM activities for 1, 2, and 3.	\$24.5	Includes exercising Option 10 plus contract admin and contingency funding. Minimum amount will maintain a viable Lock Chamber contract, but will impact project's critical path by not awarding the Site Work and Decommissioning or Approach Wall contracts.
2022	82.7	8.3	\$91.0	1) Site Work and Decommission - Exercise Options; 2) Approach Walls - Exercise Options; 3) S&A, EDC, and PM activities for 1 and 2.	\$38.9	Includes exercising Options 11-13 plus contract admin and contingency funding. Minimum amount will maintain a viable Lock Chamber contract, but will impact project's critical path by not awarding the Site Work and Decommissioning or Approach Wall contracts.
<b>Notes:</b> 1) Less than efficient annual funding could delay contract completion by approximately 28 months, resulting in \$112M in foregone benefits (\$48.3M in average benefits foregone annually) and increased contract administration costs by approximately \$14M.						
2) Efficient Funding Schedule above includes 80% confidence level of 47 months and \$116M in contingencies						
3) Yellow columns ("Minimum Required Funding") utilize the Lock Chamber contract option amounts and durations to maintain a viable contract.						
4) Lock Chamber contract includes a base with 13 Options. Options 1-3 must be awarded sequentially, Options 4-12 can be exercised in varying combinations. Efficient funding would allow concurrent work resulting in a completed contract in 5.3 years; however, minimum annual funding would extend the total duration to 7+ years. Option expiration dates are reflected in above minimum amounts.						



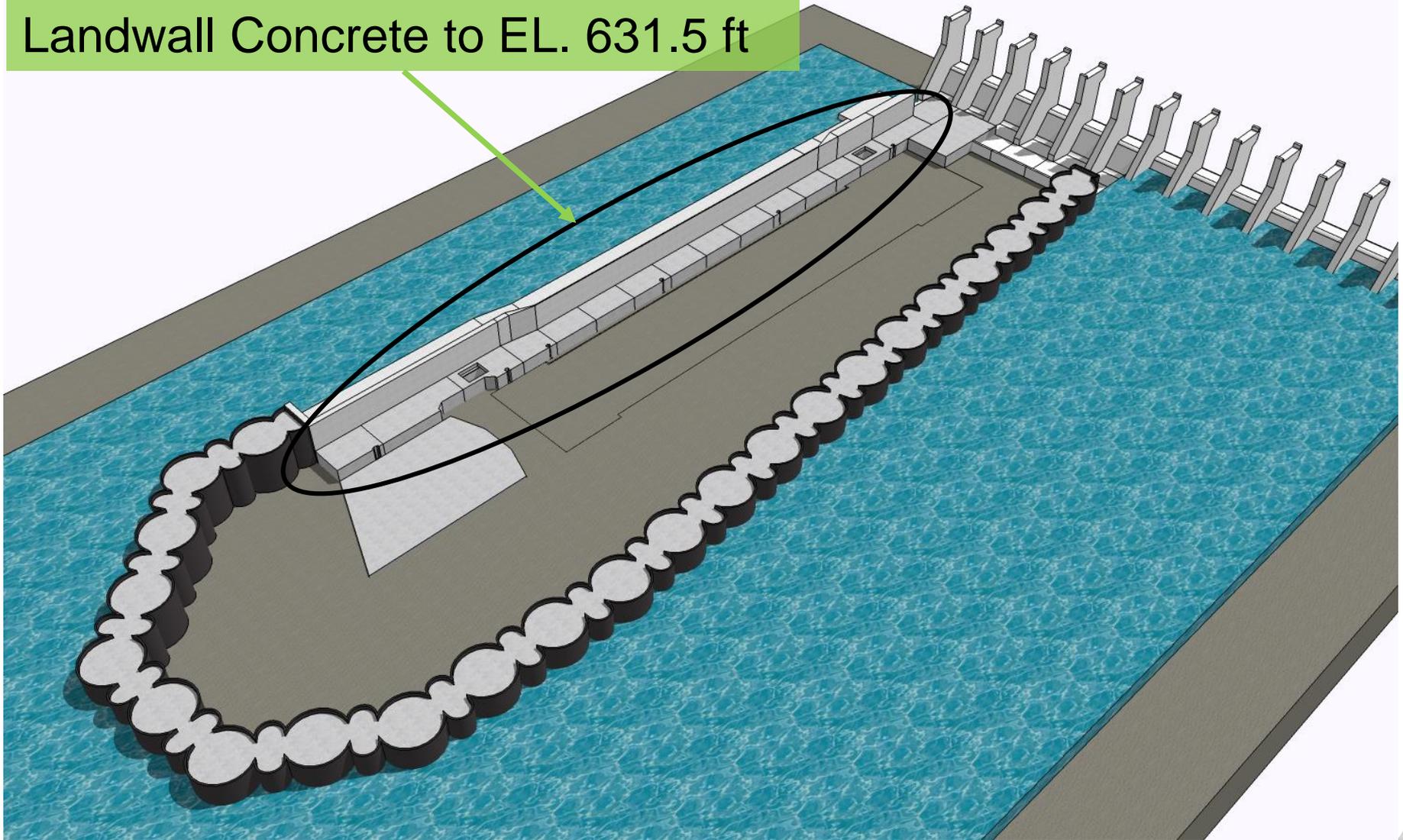
# LOCK CHAMBER CONTRACT OPTIONS 1-3

Mobilization, Concrete Delivery System, Foundation Preparations



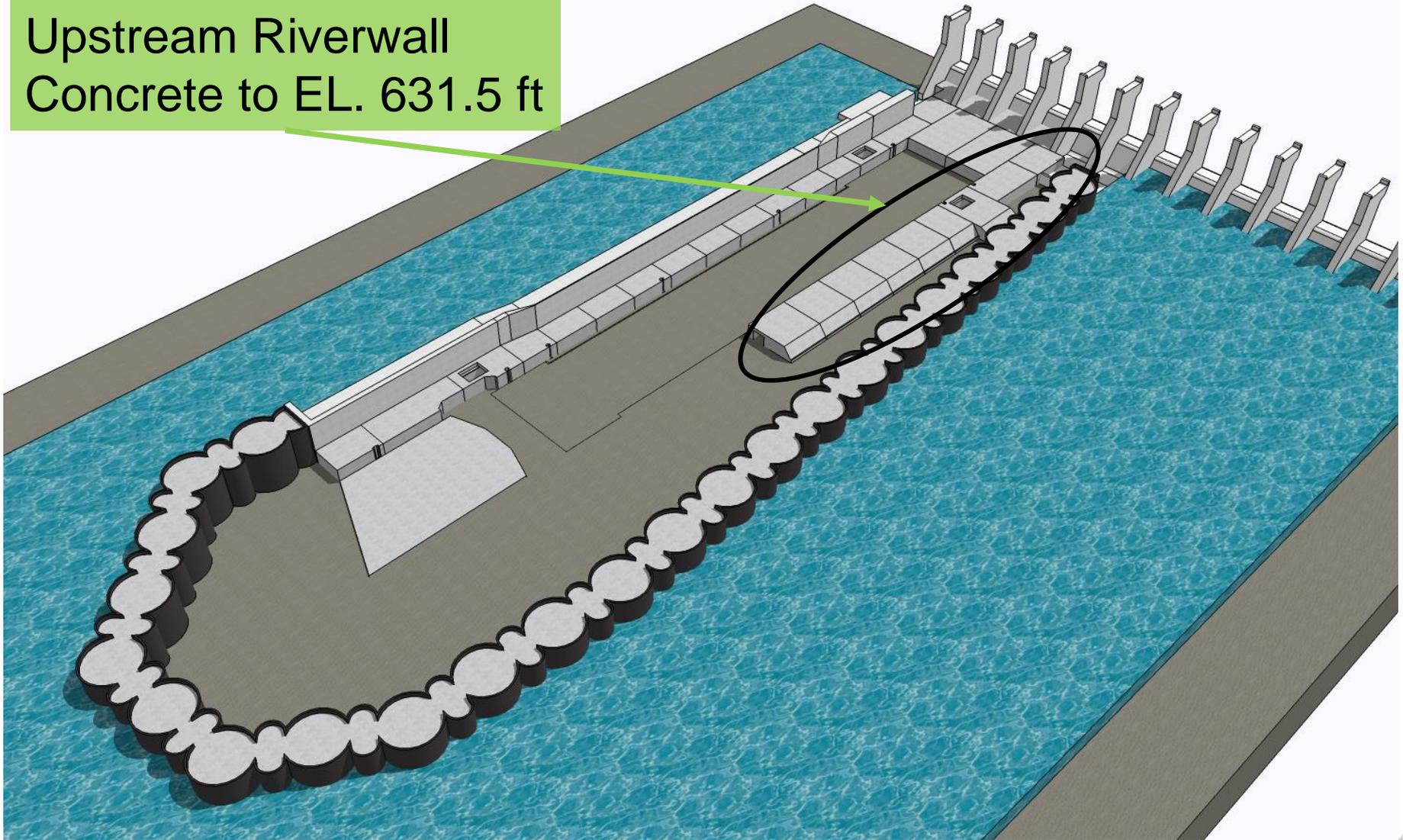
# LOCK CHAMBER CONTRACT OPTION 4

Landwall Concrete to EL. 631.5 ft



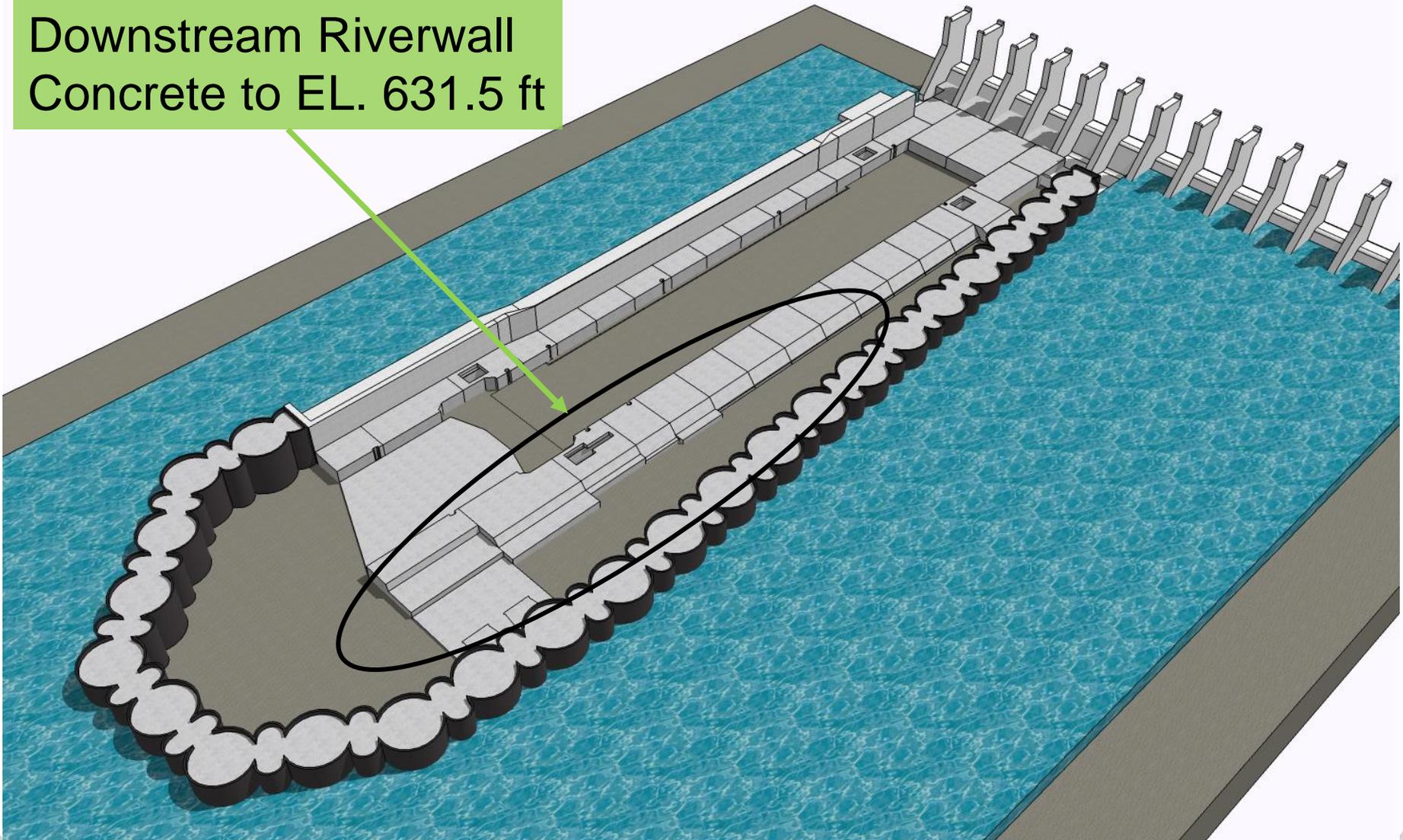
# LOCK CHAMBER CONTRACT OPTION 5

Upstream Riverwall  
Concrete to EL. 631.5 ft



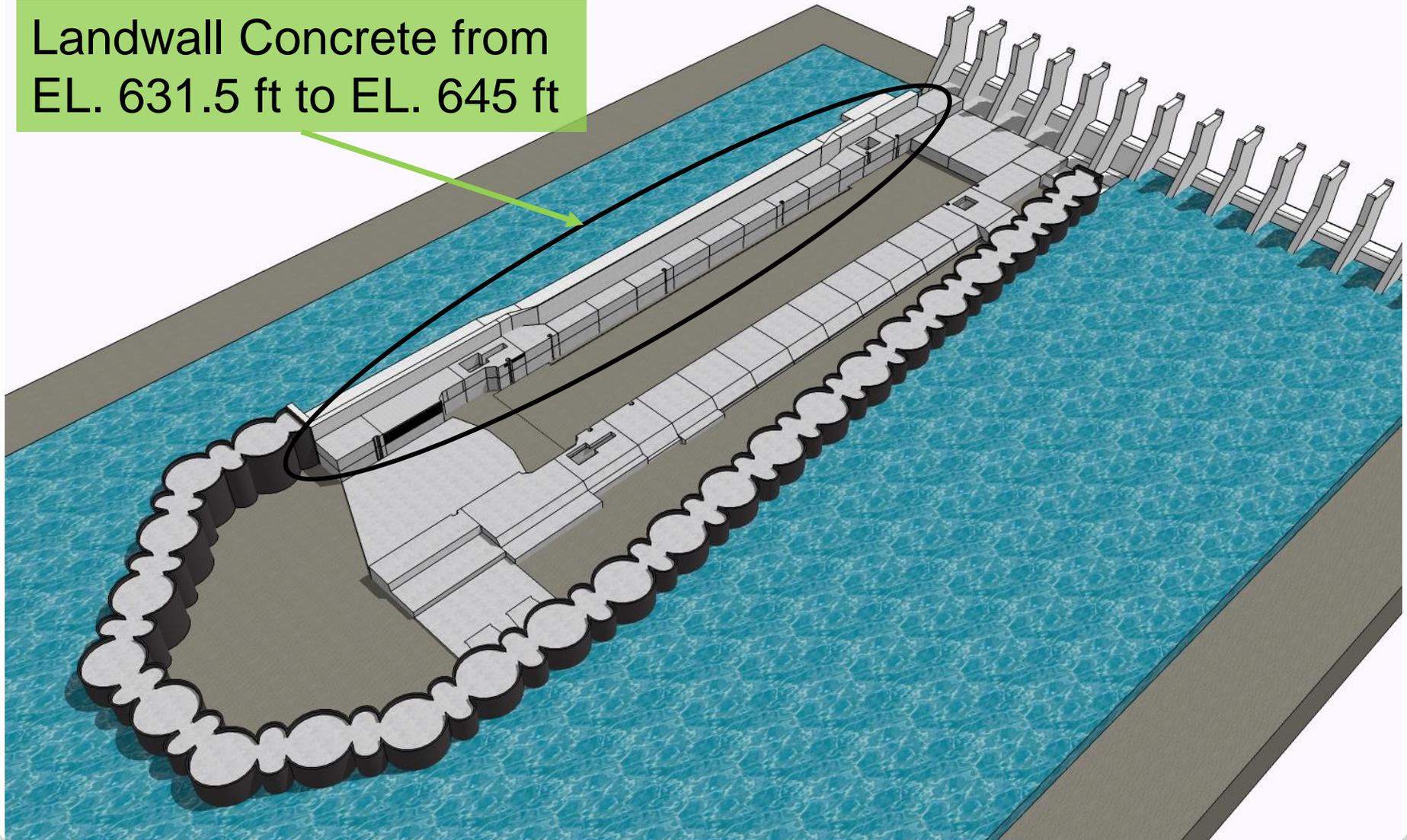
# LOCK CHAMBER CONTRACT OPTION 6

Downstream Riverwall  
Concrete to EL. 631.5 ft



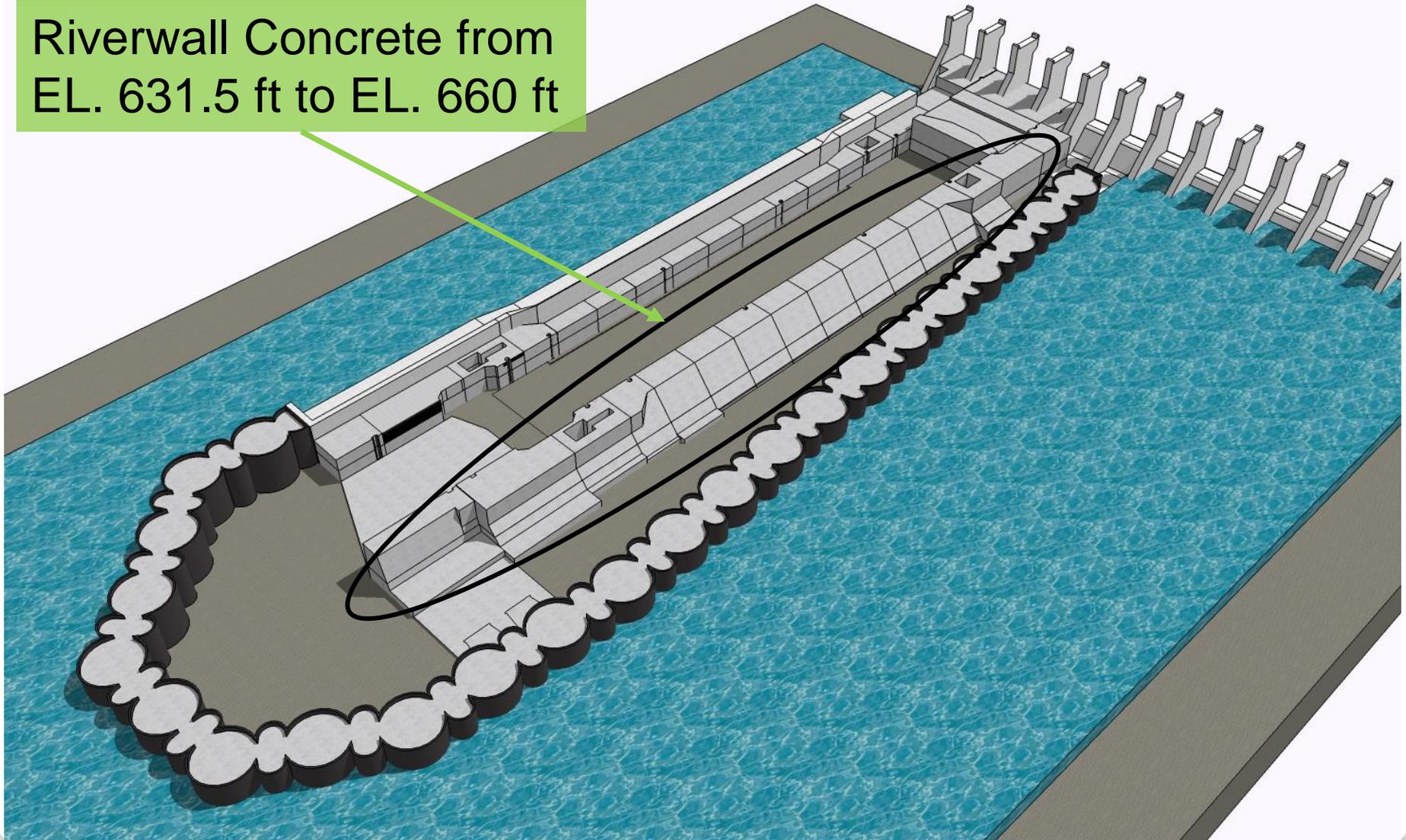
# LOCK CHAMBER CONTRACT OPTION 7

Landwall Concrete from  
EL. 631.5 ft to EL. 645 ft



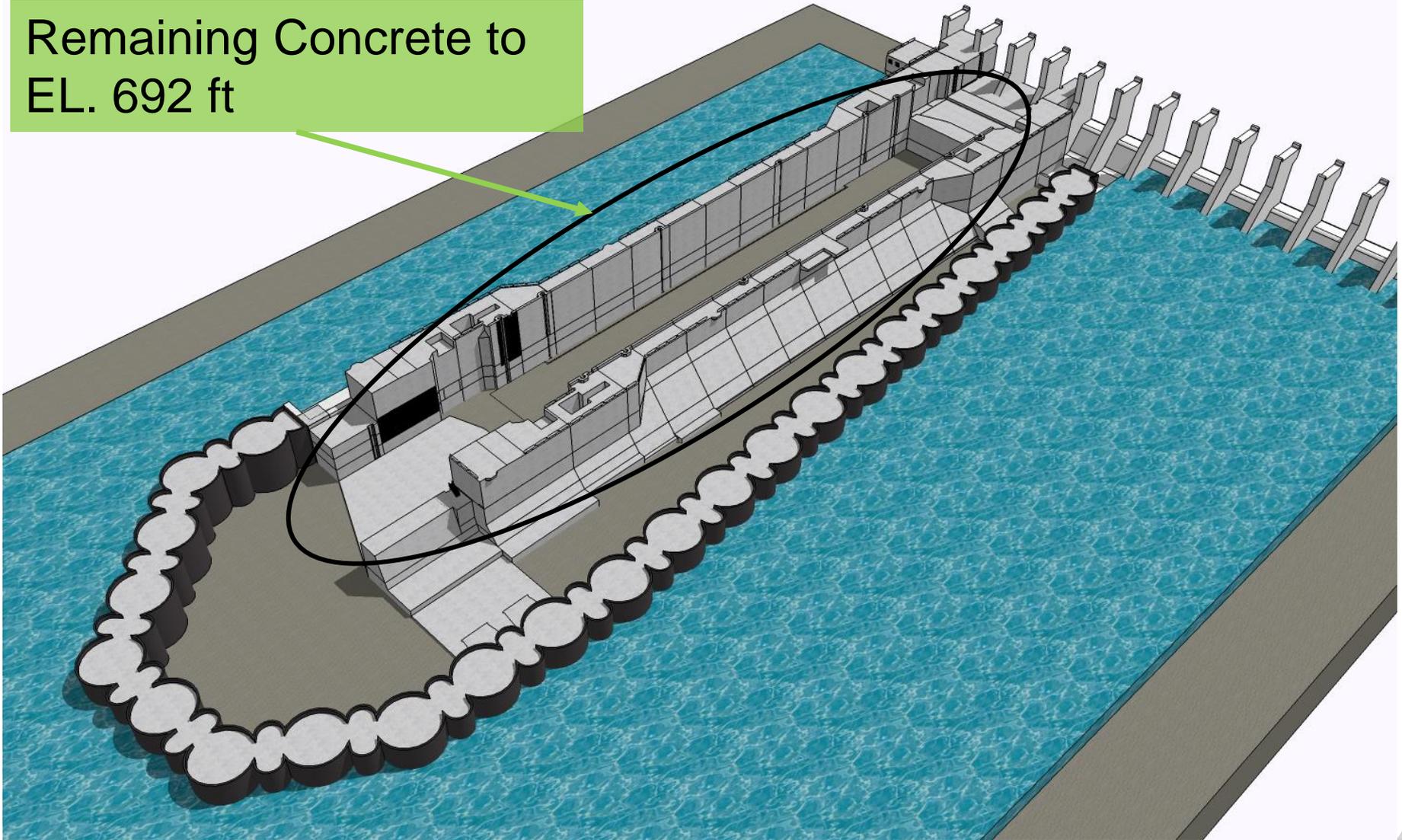
# LOCK CHAMBER CONTRACT OPTION 8

Riverwall Concrete from  
EL. 631.5 ft to EL. 660 ft



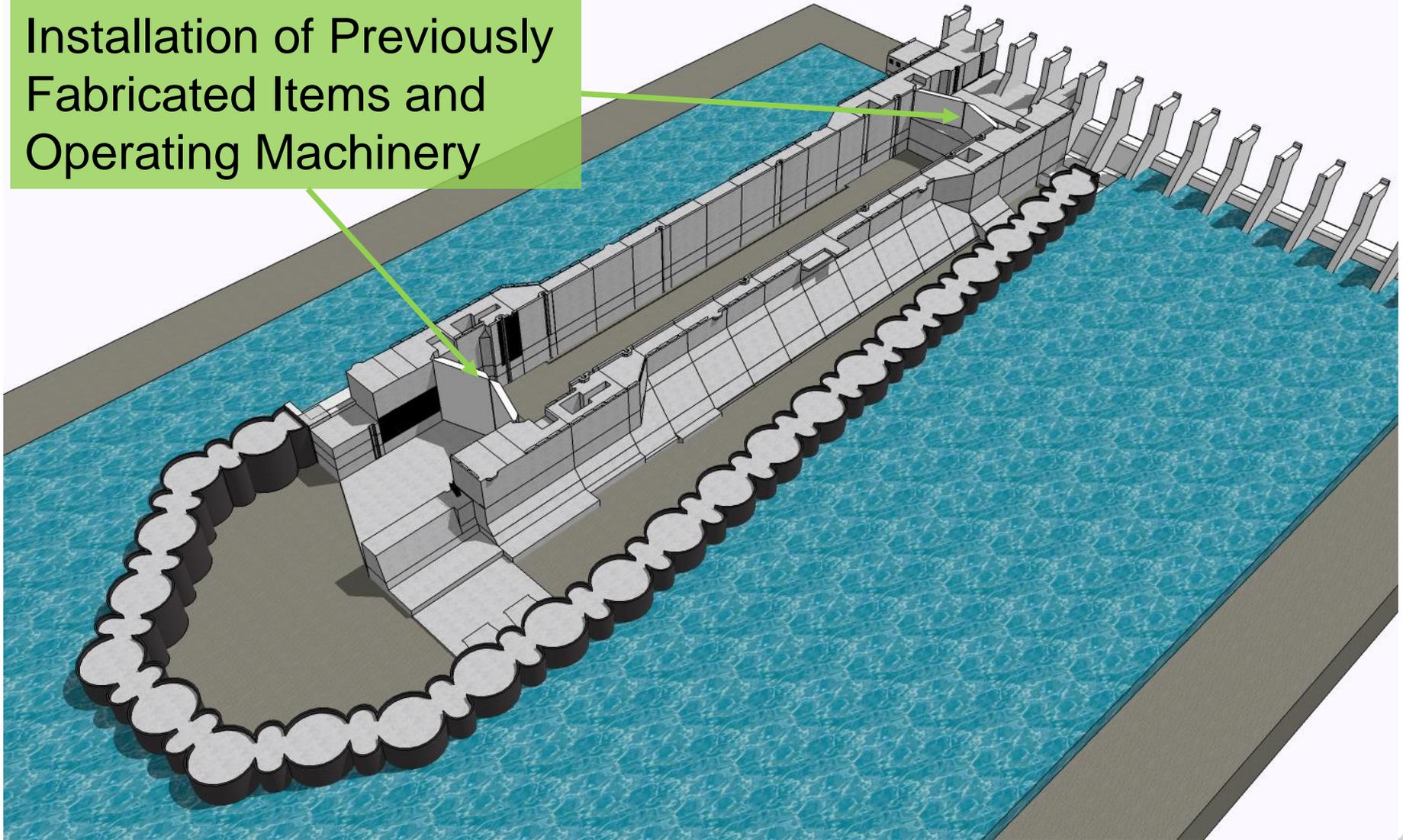
# LOCK CHAMBER CONTRACT OPTION 9

Remaining Concrete to  
EL. 692 ft



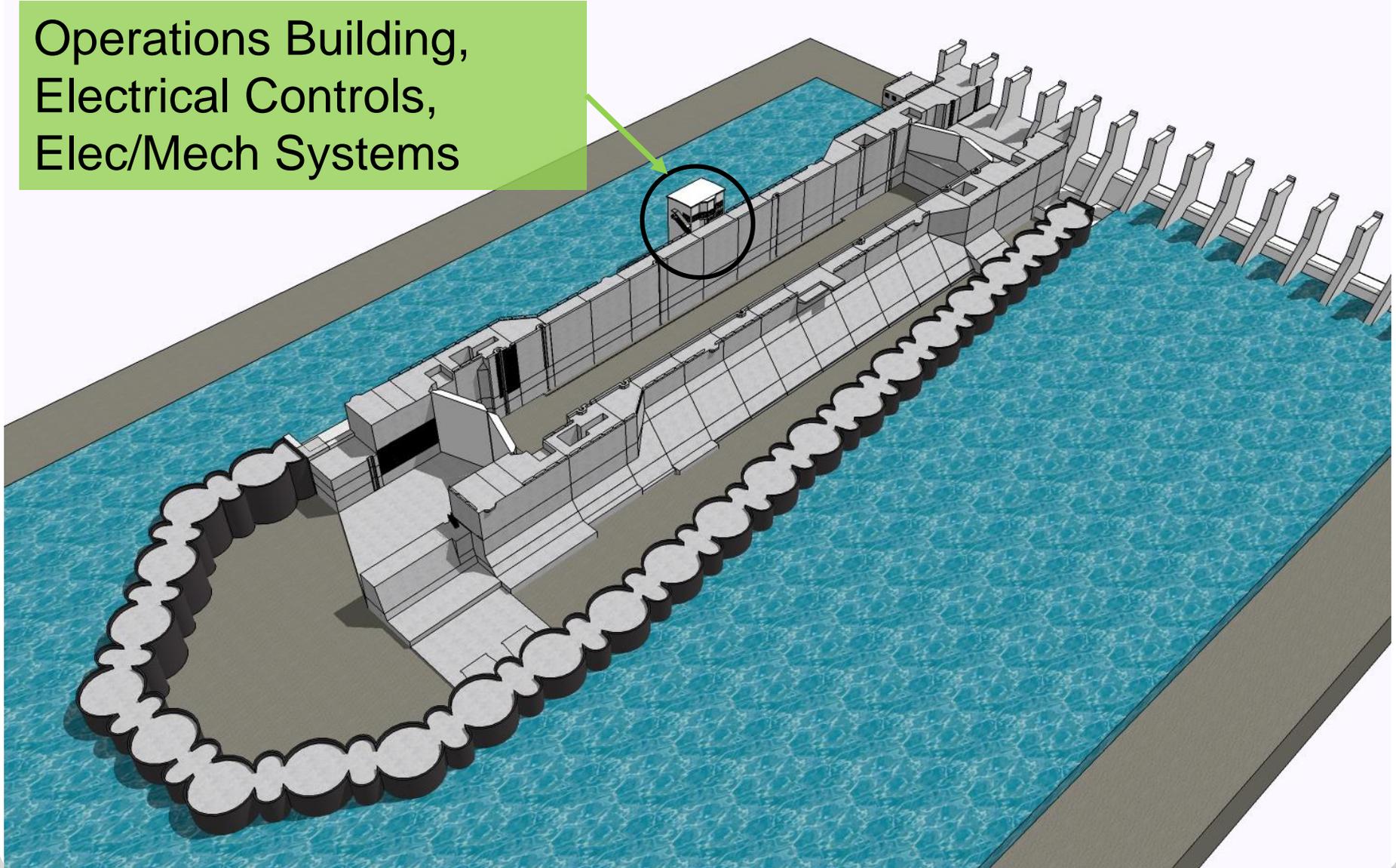
# LOCK CHAMBER CONTRACT OPTION 10

Installation of Previously  
Fabricated Items and  
Operating Machinery



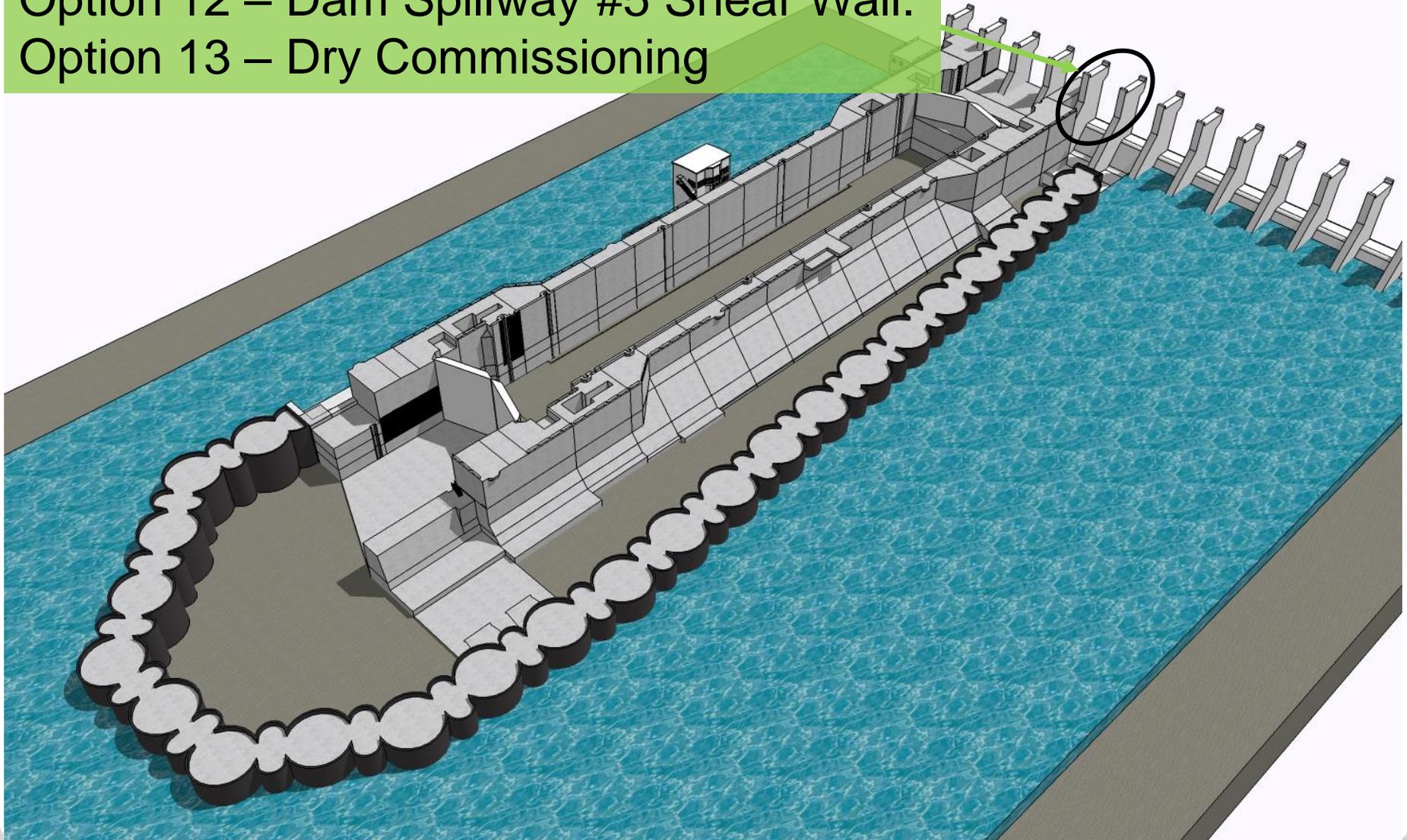
# LOCK CHAMBER CONTRACT OPTION 11

Operations Building,  
Electrical Controls,  
Elec/Mech Systems



# LOCK CHAMBER CONTRACT OPTIONS 12 & 13

Option 12 – Dam Spillway #5 Shear Wall.  
Option 13 – Dry Commissioning



# CHICKAMAUGA LOCK PROJECT SCHEDULE

Major Feature Construction	Award	Complete
Lock Excavation Construction	Sep 2016	Nov 2018
Lock Chamber	Sep 2017	~Dec 2023
Decommission and Site Work	Sep 2020	Jun 2024
Approach Walls Construction	Sep 2021	Dec 2023
PACR for 902 Exceedance <sup>1</sup>	N/A	~ June 2018

<sup>1</sup> 902 Exceedance expected by FY2020 with efficient funding.



# CHICKAMAUGA LOCK SUMMARY AND CHALLENGES

- Existing Chickamauga Lock has an **unknown finite life remaining**, the replacement lock is needed to restore reliability to the river.
- Project is ramping up construction to reflect Work Plan funding.
  - **Minimum annual funding is CRITICAL in FY18 and beyond** to maintain viable Lock Chamber contract.
- Less than efficient annual funding will slow construction progress and forego **\$48.3M in average annual benefits**.
- 2017 Errata to Economic Update results include a **BCR = 1.0 @ 7%** discount rate. BCR @ FY18 rate (2.75%) and RBRCR at both rates are healthy.
- Expect Post Authorization Change Report (**PACR**) to be completed in **FY18**, pending reviews by LRD, HQ, and ASA(CW).
  - Current Total Project Cost Estimate projected to exceed 902 Limit in FY2020 with efficient annual funding.



# QUESTIONS



Nashville District Homepage: [www.lrn.usace.army.mil](http://www.lrn.usace.army.mil)



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# REFERENCE SLIDE: LOCK CHAMBER CONTRACT BASE AND OPTIONS SCOPE OF WORK

Base	Mobilization - Concrete Batch Plant
Option 1	Mobilization - Conveyor, Testing Facilities, QA Facilities
Option 2	Mobilization, Excavation, Dental Concrete, Rock Bolts
Option 3	Mobilization, Foundation Prep, Mud Mat, Drilled Shafts
Option 4	Landwall Concrete from foundation to 5 ft above culvert (EL 631.5)
Option 5	Upper Riverwall Concrete from foundation to 5 ft above culvert (EL 631.5)
Option 6	Lower Riverwall Concrete from foundation to 5 ft above culvert (EL 631.5)
Option 7	Landwall Concrete from EL 631.5 to EL 645
Option 8	Riverwall Concrete from EL 631.5 to EL 660
Option 9	Remainder of Concrete including Handrail, Instrumentation, Access Bridge Installation, Misc Work
Option 10	Installation of Culvert Valves and Miter Gates including machinery and second pour concrete
Option 11	Operations Building, Control Shelters, Electrical and small Mechanical Items
Option 12	Dam Spillway Bay #5 Shear Wall
Option 13	Commissioning of the new lock (in the dry).

**Note: Options may not be exercised sequentially.**

