Brazos River Authority

# *Concrete Assessment and Service Life Extension (CAASLE AMENDMENT No. 3)*


***Presented by***

***Mike McClendon***

***Chief Projects Officer***

Brazos River Authority

# *Concrete Assessment and Service Life Extension Phase III (Amendment No. 3)*

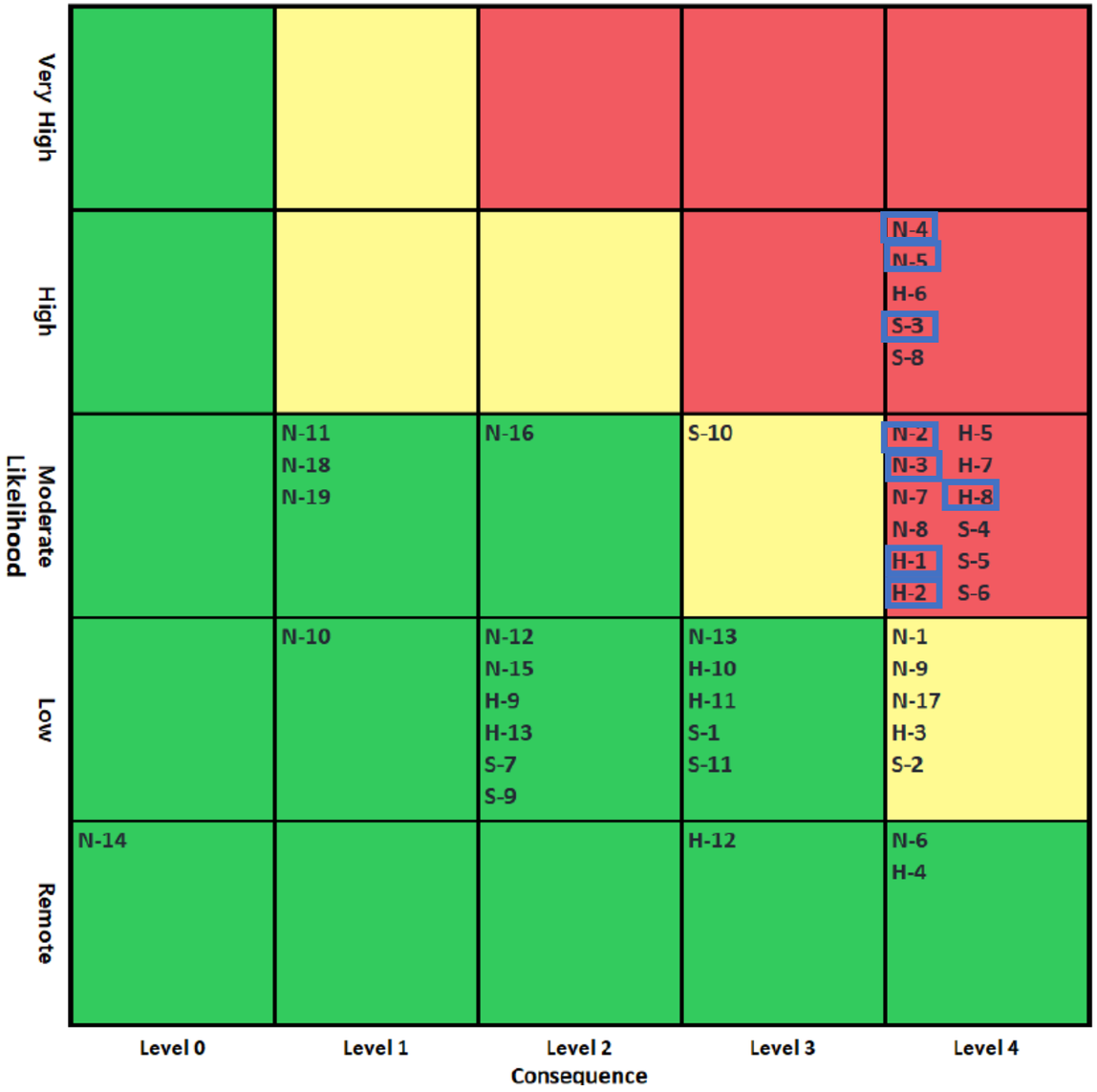
**Project Budget:** $460,000

**Budget year approved:** FY 26

**Strategic Plan Goal:** *Section II b. Ensure the operation and maintenance of BRA water supplies and associated infrastructure in a safe, responsible manner in compliance with all applicable requirements.*

*Table 1-3: Summary of Higher-Risk Potential Failure Modes Identified in 2019 SQRA*

| PFM Number | PFM Title | Likelihood | Consequence | Confidence |
|---|---|---|---|---|
| N-2 | Bulkhead Deck Slab Failure due to Structural Concrete Deterioration during Normal Operations | Moderate | Level 4 | Medium |
| N-3 | Spillway Deck Slab Failure due to Structural Concrete Deterioration during Normal Operations | Moderate | Level 4 | Medium |
| N-4 | Upstream Bulkhead Corbel Failure due to Structural Concrete Deterioration during Normal Operations | High | Level 4 | Poor |
| N-5 | Upstream Spillway Corbel Failure due to Structural Concrete Deterioration during Normal Operations | High | Level 4 | Poor |
| H-1 | Upstream Deck Slab Failure due to Structural Inadequacy during Hydrologic Event | Moderate | Level 4 | Medium |
| H-2 | Upstream Corbel Failure due to Structural Inadequacy during Hydrologic Event | Moderate | Level 4 | Poor |
| H-8 | Downstream Spillway Slab Failure due to Structural Concrete Deterioration during Hydrologic Event | Moderate | Level 4 | Medium |
| S-3 | Corbel Failure due to Structural Inadequacy caused by Seismic Event | High | Level 4 | Poor |



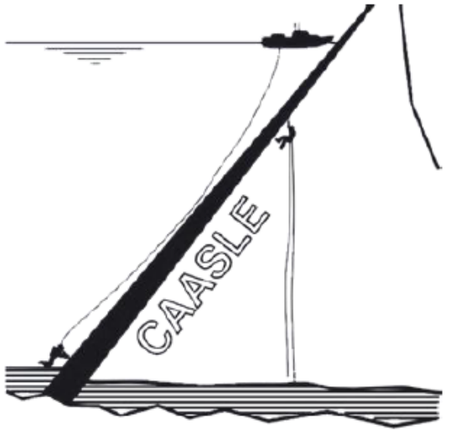
# CAASLE Amendment No. 3



## MORRIS SHEPPARD DAM

CONCRETE ASSESSMENT AND SERVICE LIFE EXTENSION (CAASLE)

Phase III Long-Term Structural Concrete Testing & Repair Program
Palo Pinto County, Texas
May 12, 2023
**GF Job No.: 068993 | BRA RFP No.: 15-09-898**




Brazos River Authority

GANNETT FLEMING

*Table 2-1: Priority Levels of Structural Features*

| Feature | Priority Level |
|---|---|
| Upstream Slabs | High |
| Upstream Corbels | High |
| Crest Slabs | Medium |
| Crest Slab Corbels | Medium |
| Buttresses | Medium |
| Apron Slabs | Low |
| Cross-Canyon Stiffener Beams | Low |
| Downstream Corbel | Low |

# CAASLE Amendment No. 3

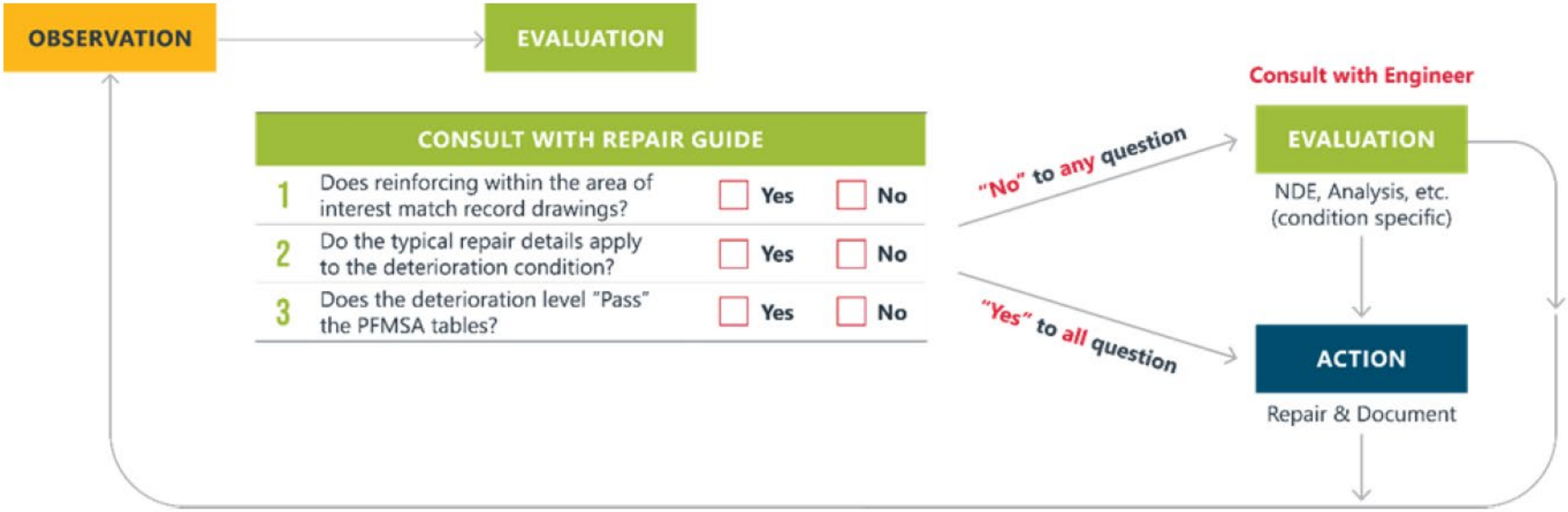



*Figure 3-1: Investigation and Repair Guide Flowchart*

# Amendment Number 3

| | |
|---|---|
| Phase III PSA NTE: | $765,178 |
| Amend. No. 1: | $ 60,000 |
| Amend. No. 2: | $300,000 |
| | $1,125,178 |
| **Proposed Amend. No. 3** | $460,000 |
| New Phase III PSA NTE: | **$1,585,178** |

Bay 31 Buttress 31 Corbel Repair

# Example of Concrete Repairs

“**BE IT RESOLVED** that the Board of Directors of the Brazos River Authority hereby authorizes the General Manager/CEO to execute Amendment Number 3 to the Professional Services Agreement with Gannett Fleming TranSystems Inc. for Phase III of the Concrete Assessment and Service Life Extension project increasing the total not to exceed amount by $460,000.”

Brazos River Authority

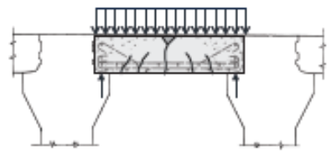
# Brazos

## RIVER AUTHORITY

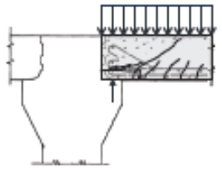
# CAASLE Amendment No. 2

## OBSERVATION

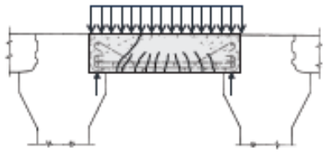
### SLABS



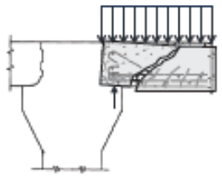
A. Flexural Failure



C. Shear – Tension Failure



B. Diagonal Tension Failure

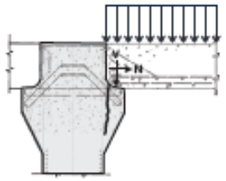


D. Shear – Compression Failure

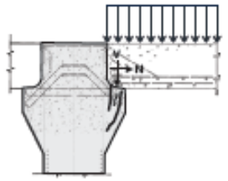
Flexural Cracking Example

Shear/Tension Cracking Example

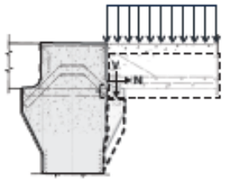
### CORBELS



A. Flexural Failure



B. Diagonal Tension Failure



C. Direct Shear Failure

Cracking Example

## EVALUATION

### 1 Does reinforcing within the area of interest match record drawings?

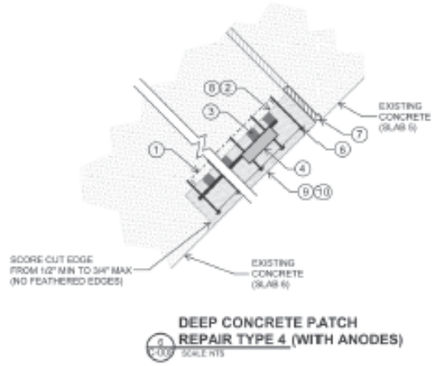
**Reference:** APPENDIX E

Typical Upstream (Deck) Slab Record Drawing Reinforcement (Flexural)

| | Number | Upper Elevation | Lower Elevation | Rebar Size | Rebar Spacing (in.) | Number of Layers |
|---|---|---|---|---|---|---|
| NON-OVERFLOW | 1 | 1015 | 1005 | 8 | 5.00 | 1 |
| | 2 | 1005 | 993 | 10 | 5.25 | 1 |
| | 3 | 993 | 981 | 10 | 4.50 | 1 |
| | 4 | 981 | 969 | 10 | 4.00 | 1 |
| | 5 | 969 | 957 | 10 | 3.75 | 1 |
| | 6 | 957 | 945 | 10 | 7.00 | 2 |
| | 7 | 945 | 933 | 10 | 6.75 | 2 |
| | 8 | 933 | 921 | 10 | 6.50 | 2 |
| | 9 | 921 | 909 | 10 | 6.25 | 2 |
| | 10 | 909 | 897 | 10 | 6.00 | 2 |
| | 11 | 897 | 885 | 10 | 5.50 | 2 |
| SPILLWAY | 1 | 969 | 957 | 10 | 7.00 | 2 |
| | 2 | 957 | 945 | 10 | 7.25 | 2 |
| | 3 | 945 | 933 | 10 | 6.75 | 2 |
| | 4 | 933 | 921 | 10 | 6.25 | 2 |
| | 5 | 921 | 909 | 10 | 6.00 | 2 |
| | 6 | 909 | 897 | 10 | 5.75 | 2 |

### 2 Do the typical repair details apply to the deterioration condition?

**Reference:** APPENDIX E




DEEP CONCRETE PATCH REPAIR TYPE 4 (WITH ANODES)

### 3 Does the deterioration level "Pass" the PFMSA tables?

**Reference:** Failure Mode Progression Structural Analyses, August 2022

Bulkhead Slabs - PMF Loading Conditions - Flexural DCRs

| Slab Number | Elevation (ft) Center of Slab | Percentage of Reinforcement Remaining [1] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
| 2 | 1010 | 2.41 | 1.21 | 0.81 | 0.61 | 0.49 | 0.41 | 0.36 | 0.32 | 0.28 | 0.26 |
| 3 | 999 | 3.24 | 1.63 | 1.09 | 0.83 | 0.67 | 0.56 | 0.48 | 0.42 | 0.38 | 0.34 |
| 4 | 987 | 3.54 | 1.78 | 1.19 | 0.90 | 0.72 | 0.61 | 0.52 | 0.46 | 0.41 | 0.37 |
| 5 | 975 | 3.65 | 1.83 | 1.23 | 0.93 | 0.75 | 0.63 | 0.54 | 0.47 | 0.42 | 0.38 |
| 6 | 963 | 3.77 | 1.89 | 1.27 | 0.96 | 0.77 | 0.65 | 0.56 | 0.49 | 0.44 | 0.40 |
| 7 | 951 | 4.00 | 2.01 | 1.35 | 1.02 | 0.82 | 0.69 | 0.59 | 0.52 | 0.47 | 0.42 |
| 8 | 939 | 3.79 | 1.91 | 1.28 | 0.96 | 0.78 | 0.65 | 0.56 | 0.49 | 0.44 | 0.40 |
| 9 | 927 | 3.84 | 1.93 | 1.29 | 0.98 | 0.79 | 0.66 | 0.57 | 0.50 | 0.45 | 0.40 |
| 10 | 915 | 4.02 | 2.02 | 1.35 | 1.02 | 0.83 | 0.69 | 0.59 | 0.52 | 0.47 | 0.42 |
| 11 | 903 | 4.31 | 2.17 | 1.45 | 1.10 | 0.88 | 0.74 | 0.64 | 0.56 | 0.50 | 0.45 |
| 12 | 891 | 4.32 | 2.17 | 1.46 | 1.10 | 0.89 | 0.74 | 0.64 | 0.56 | 0.50 | 0.46 |
| 13 | 879 | 4.47 | 2.25 | 1.51 | 1.14 | 0.92 | 0.77 | 0.66 | 0.58 | 0.52 | 0.47 |
| 14 | 867 [2] | 4.79 | 2.41 | 1.61 | 1.22 | 0.98 | 0.82 | 0.71 | 0.62 | 0.56 | 0.50 |
| 15 | 855 [2] | 4.84 | 2.43 | 1.63 | 1.23 | 0.99 | 0.83 | 0.72 | 0.63 | 0.56 | 0.51 |
| 16 | 843 [2] | 4.87 | 2.45 | 1.64 | 1.24 | 1.00 | 0.84 | 0.72 | 0.63 | 0.57 | 0.51 |
| 17 | 831 [2] | 5.12 | 2.58 | 1.73 | 1.30 | 1.05 | 0.88 | 0.76 | 0.67 | 0.60 | 0.54 |

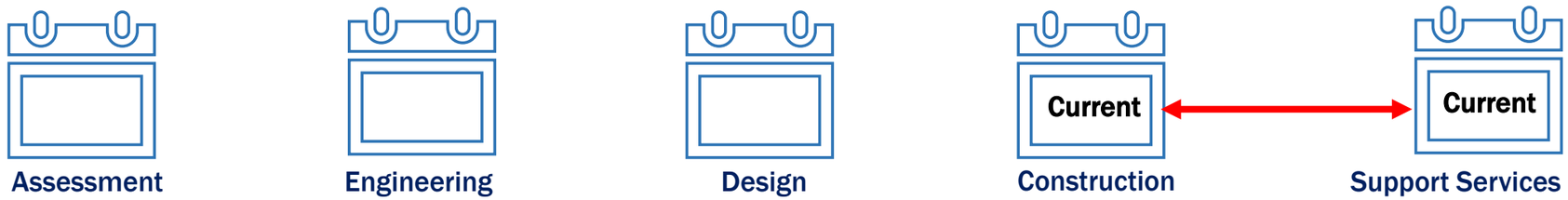
# Pier Plate Wall Repairs

# Concrete Assessment And Service Life Extension Project

## CAASLE Budget/Schedule

| Location | Project | CIP/OP | Estimated Cost | FY 21 | FY 22 | FY23 | FY 24 | FY 25 | FY26 | FY 27 | FY 28 | FY 29 | FY 30-35 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PK | CAASLE Phase III | OP | $1,125,178 | | | | | | | | | | |
| Assessment Design | | | | $825,000 | | | $300,000 | | $300,000 | | | | |
| Construction | | | | | | | | | | | | | |

## Schedule/Status




## BRA's Strategic Plan

*In accordance with BRA's Strategic Plan: Section II b. Ensure the operation and maintenance of BRA water supplies and associated infrastructure in a safe, responsible manner in compliance with all applicable requirements.*

Brazos River Authority