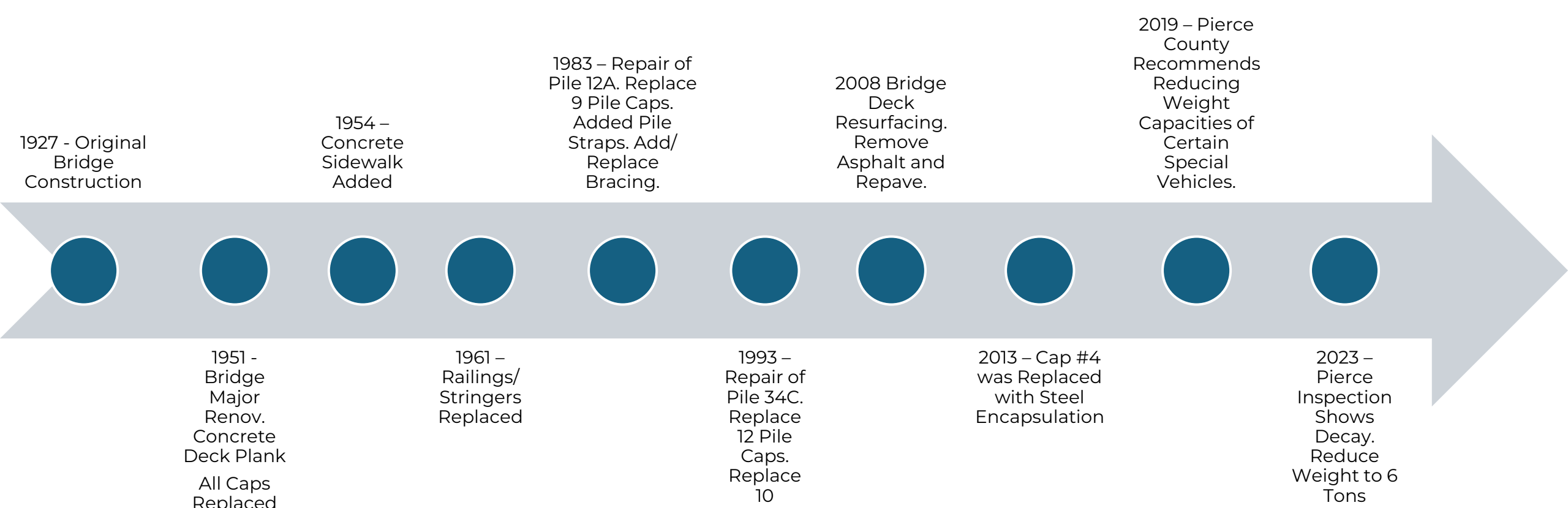
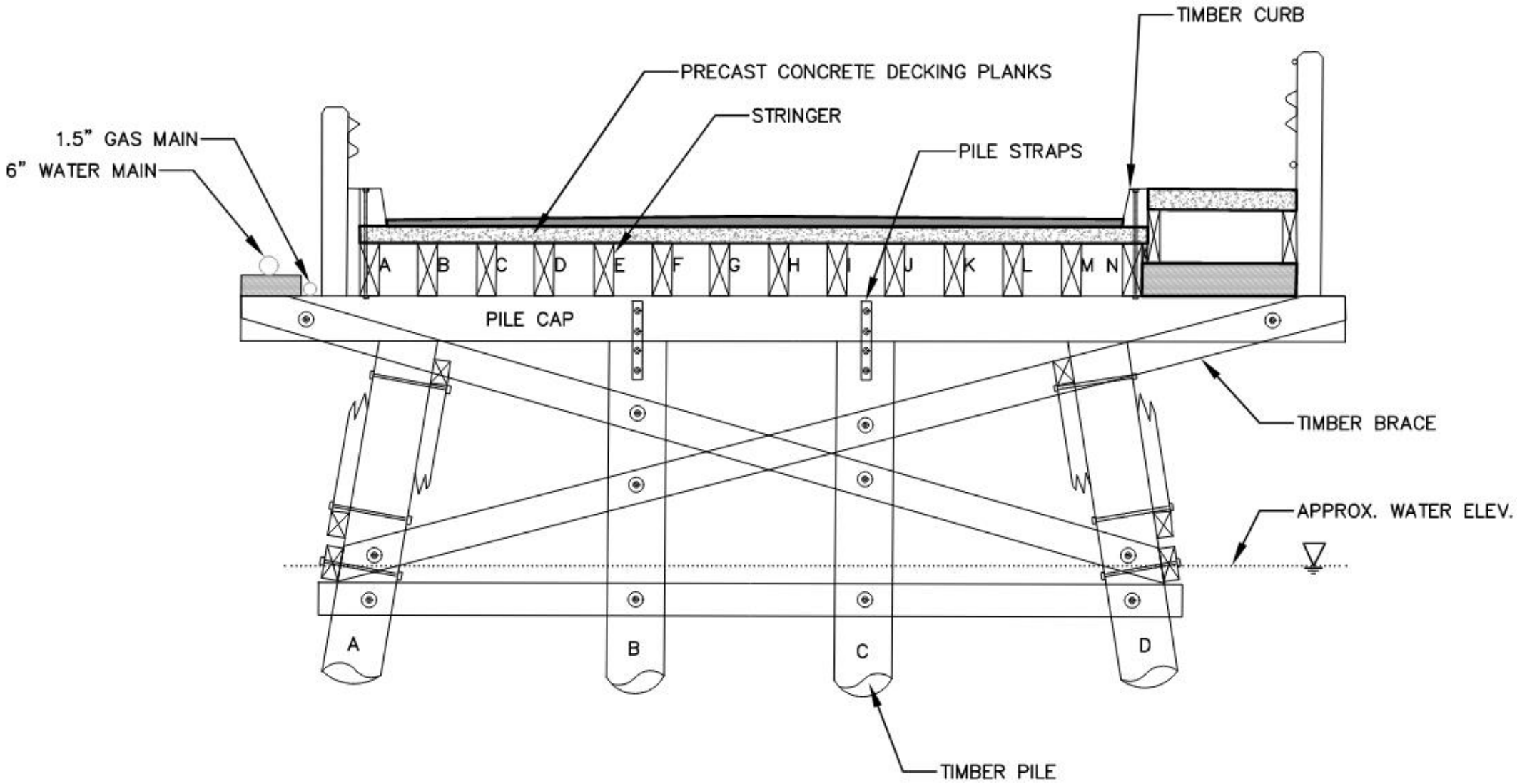
Lake Steilacoom Bridge Repair Update

City of Lakewood

Bridge Construction/Repair Timeline





Bridge Component Terms

Current Bridge Condition Summary

- Piles Below Water Surface – In general, the pilings are good condition below the surface. Random ¼" striations in the piles due to fungal infection. Piles 12A and 34C have previously been spliced below water level with metal collar.
- Piles Above Water Surface – 168 total piles. 7 of which show some signs of decay. None of them appear critical presently.
- Abutments – Both appear in good condition. A 3" crack was noted in the inspection in 1997. The crack has not grown since that time.
- Pile Caps – 42 caps total. Recommendation is to replace 17 caps this year. Remainder appear to be in good condition presently.
- Timber Braces – In general, these are in good condition. The City will need to replace some of these that have been damaged/decayed through the years.
- Stringers – 19 stringers have been identified by the inspection team as candidates to replace this year. These stringers are all on the outside edges of the bridge where penetrations via the bolts from the timber vehicle curb anchor have introduced weaknesses in the timber treatment. All interior stringers are in good condition with a few having defects which have not worsened through the years.
- Deck – Deck subsurface is precast concrete planks that are in good condition. Roadway portion was milled and overlayed in 2008. Pedestrian sidewalk is in good shape and fishing platforms currently appear suitable.
- Timber Curbing – Curbing was most recently replaced in 2021. The curb is in decent condition with the exception of a single segment that will be replaced during this closure.
- Railing – The railing posts are starting to show signs of decay. While this is not critical to reopen the structure, it will require maintenance in the coming years.
- Utilities – Existing 6" water main and 1.5" abandoned gas main hang off the north side of the bridge were installed in 1960/70's. The water main is maintained by Lakewood Water District.

Pile Cap Failure

Cap is pulling the deck down in this condition, causing harm to surrounding members

½” Shell thickness in Pile Cap 15 caused a 1.5” compressive failure. Photo to the left shows the compression on the cap of Bent 15 on May 14, 2024. Photo above is a representation on the interior condition of the pile cap.

Pile Cap Condition

Pile Cap Replacement in 2013 – Steel Encapsulation

WSDOT performed a steel encapsulation of the cap on Bent 4 in 2013. It is expected that the cost for this treatment will be much more significant than the replacement of the timbers. Additionally, material is not available during the current fish window.

Bridge Repair Option 1

This option includes work performed to replace the pile caps which currently have a critical finding rating. Without replacing these caps, the bridge cannot reopen. Caps on Bents 6, 12, 15, 16, 21, 33, 40, and 43 are at the point where the beams can no longer support adequate weight to keep the bridge open.

Five of the eight caps listed as critical, including the most critical beam which caused the immediate full closure, were replaced in 1983.

The estimated cost for option 1 is $467,000. This is primarily driven by the excessive cost for the contractor to set up the mobilize such an operation and set up a barge system required to replace the caps.

Traffic Control and Closure Rentals:	$12,000.00
Permits and Design/Advertising:	$10,000.00
Material Procurement:	$15,000.00
Contractor Labor and Equipment:	$430,000.00
Total Estimated Cost (Option 1):	$467,000.00

Bridge Repair Option 2

This option includes work performed to replace the pile caps which currently have a critical finding rating and those which our structural engineer have determined to be a good portion of the way into the decay process. While we cannot say for certain that the beams listed here for replacement won't make it shorter or last longer, this option is expected to replace caps which are expected to be or enter the critical stage in the next 2-5 years.

This option will replace 10 caps and 10 stringers immediately near/selectively chosen for replacement.

The estimated cost for option 2 is $535,000. This is again primarily driven by the excessive cost for the contractor to set up the mobilize such an operation and set up a barge system required to replace the caps and stringers.

Traffic Control and Closure Rentals:	$12,000.00
Permits and Design/Advertising:	$10,000.00
Material Procurement:	$23,000.00
Contractor Labor and Equipment:	$490,000.00
Total Estimated Cost (Option 2):	$535,000.00

Bridge Repair Option 3

This option includes work performed to replace the pile caps which currently have all members which our structural engineer have entered into the decay process. While we cannot say for certain that the beams listed here for replacement won't make it shorter or last longer, this option is expected to replace caps which are expected to be or enter the critical stage in the next 5-10 years.

This option will replace 17 caps and 19 stringers which have been determined to have entered the decaying process.

The estimated cost for option 3 is $829,000.

Traffic Control and Closure Rentals:	$12,000.00
Permits and Design/Advertising:	$10,000.00
Material Procurement:	$37,000.00
Contractor Labor and Equipment:	$770,000.00
Total Estimated Cost (Option 3):	$829,000.00

Bridge Repair Option 4

This option includes work performed to replace all pile caps and only the stringers which are identified as a portion of Option 3. The cap on Bent 4 will not need to be replaced under this option. It was retrofitted with a steel encapsulation operation in 2013.

Some of the existing caps replaced during the 1951 retrofit of the bridge have been performing better against decay as a result of the differing treatment processes permitted during that time. Replacing the caps which have not yet entered the decay stages will not ensure a longer cycle between replacement of the caps.

This option will replace 41 caps and the 19 stringers which have been determined to have entered the decaying process.

The estimated cost for option 4 is $1,537,000.

Traffic Control and Closure Rentals:	$12,000.00
Permits and Design/Advertising:	$15,000.00
Material Procurement:	$90,000.00
Contractor Labor and Equipment:	$1,420,000.00
Total Estimated Cost (Option 4):	$1,537,000.00

Bridge Repair Option 5

This option includes work performed to replace all pile caps and outside stringers which are the most frequently replaced. The cap on Bent 4 will not need to be replaced under this option. It was retrofitted with a steel encapsulation operation in 2013.

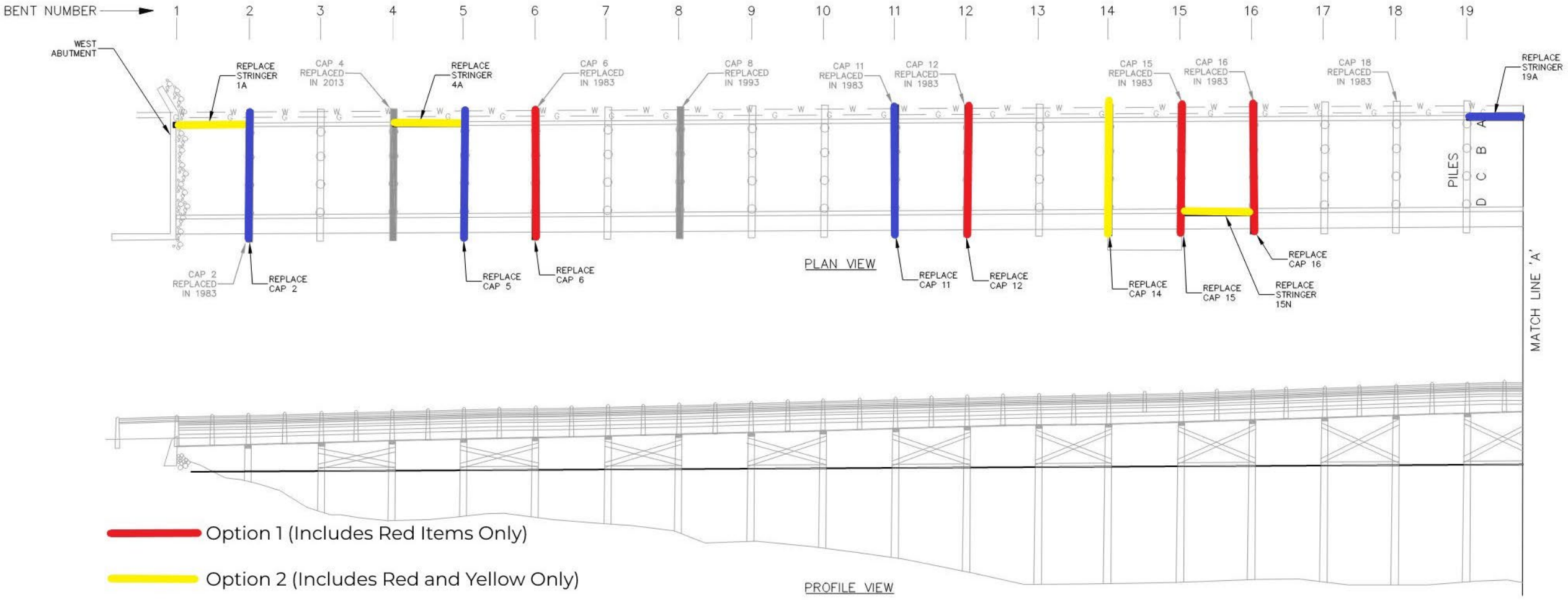
Some of the existing caps replaced during the 1951 retrofit of the bridge have been performing better against decay owing to the differing treatment processes permitted during that time. Replacing the caps which have not yet entered the decay stages will not ensure a longer cycle between replacement of the caps.

This option will replace 41 caps and 172 stringers. which have been determined to have entered the decaying process. This will be spread out over a two-year period as the fish window is limited to a three ten-week period.

The estimated cost for option 5 is $2,817,000.

Traffic Control and Closure Rentals:	$12,000.00
Permits and Design/Advertising:	$15,000.00
Material Procurement:	$140,000.00
Contractor Labor and Equipment:	$2,650,000.00
Total Estimated Cost (Option 5):	$2,817,000.00

Which Wooden Members Need to be Replaced?



Option 1 (Includes Red Items Only)

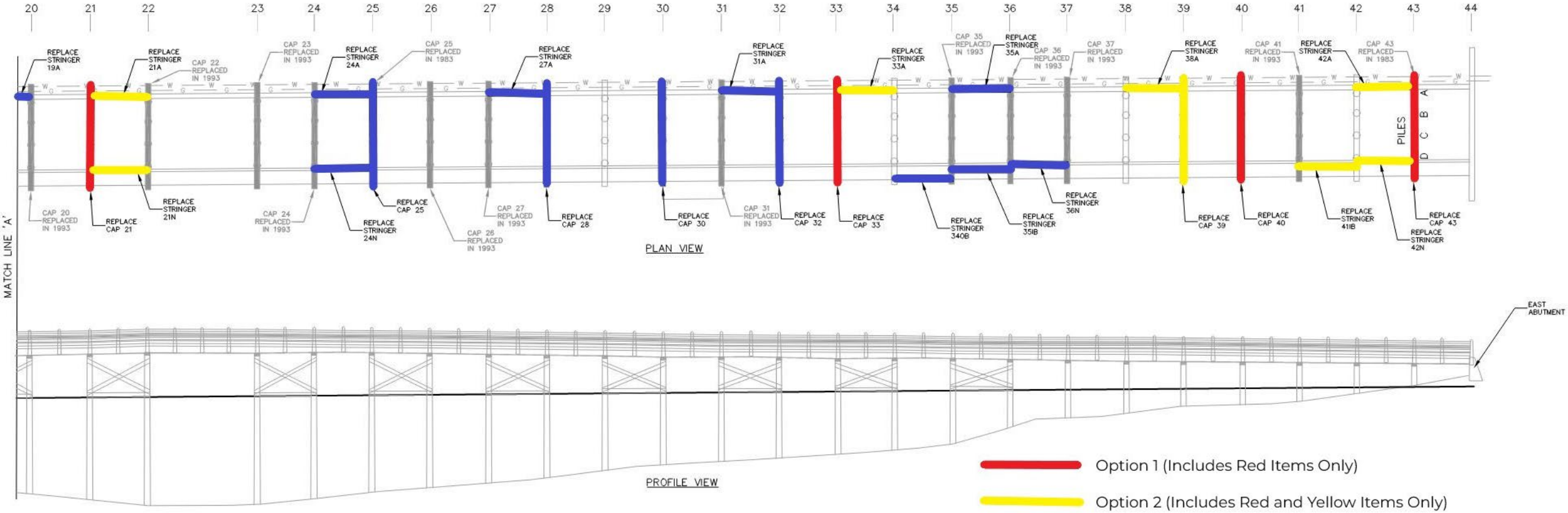
Option 2 (Includes Red and Yellow Only)

Option 3 (Includes, Yellow, and Blue Items)

Option 4 (Includes all Caps and Option 3 Stringers)

Option 5 (Includes all Caps and all Outside Stringers)

Which Wooden Members Need to be Replaced (Cont.)?



Option 1 (Includes Red Items Only)

Option 2 (Includes Red and Yellow Items Only)

Option 3 (Includes Red, Yellow, and Blue Items)

Option 4 (Includes all Caps and Option 3 Stringers)

Option 5 (includes all Caps and Outside Stringers)

Repair Recommendation

It is recommended that the City proceeds with option 3 (replacement of all pile caps and stringers currently experiencing decay). As previously mentioned, some of the 70 year old caps and stringers are more resistant to decay than the newer replacements 30-40 years of age. Replacing the members currently showing signs of decay provides the largest economic benefit for the long term for the maintenance of the bridge. As shown in the estimates, the majority of the cost of replacement is obtaining a contractor to set up the systems to be able to lift the bridge repetitively.

After removing bracing, securing the sidewalk and utilities, the contractor will use falsework, friction collars, and a synchronous jacking system to lift the bridge up approximately 1.25”. They will then cut the bad sections of pile cap out. Once removed, crews will lower and move the new timber cap into place using a boom truck and roller systems. They’ll secure the new cap, reconnect bracing, and lower the bridge. Falsework will be removed, and crews will reset on the next bent.

Pile Cap Replacement

Equipment and Construction Area

It is likely that the contractor will need to bring in a modular barge and a few work boats to get crew and material out to the barge daily. They will buoy off the work area for the public and worker safety. They will also use boom trucks to lower material on to the barge.

The duration of work is expected to last approximately two months.

Future Concerns?

- The rail posts have show significant deterioration and will need to be replaced at some point in the future.

- Additionally, seven piles have issues above and right at the water level. Options will be evaluated in the coming years and presented to Council for further discussion.

- Timber braces are starting to wear and may need to be reviewed.

- Continue to monitor the bridge every two years above water and five years below water