Sammamish DAR Bridge Pier Scour

I-405 MP 23.60 Sammamish River: Internal Scour Result Coordination (DRAFT)

Background

As part of an on-going effort of partnership in a path forward for resolution of the current dispute of Lateral Migration at the Sammamish River, the AECOM team has refined the results previously provided to WSDOT in an email on 2/10/26. This document summarizes the updated results as of 2/16/2026.

Reference Documents

The following is a list of references used to prepare this assessment:

- WSDOT *Hydraulics Manual* (2022)
- Federal Highways Administration Hydraulic Engineering Circular No. 18 – Evaluating Scour at Bridges Firth Edition (FHWA 2012)

Scour Results

Scour was assessed for two scenarios, (1) without lateral migration and (2) with lateral migration (per WSDOT Interpretive Engineering Determination (IED), dated 6/13/25).

Scour was calculated for each DAR bridge pier with the FHWA Hydraulic Toolbox, accounting for three 9.84 diameter, round-nosed columns, skewed to flow at 15 degrees. The resulting total scour depth included in the tables includes pier scour and 1.8 feet of long-term degradation as documented in the FHD report.

Results are presented for three high-flow events, the 100-year, 500-year and the 2080 100-year. The WSDOT Hydraulics Manual defines the “scour design flood” as the greater of the 100-year of 2080 100-year. Similarly, the “scour check flood” is the greater of the 2080 100-year or 500-year. The 2080 100-year produces the greatest total scour as shown in the table.

Abutments 1 and 6 as well as Piers 2 and 5 were not evaluated as part of this analysis because they are well beyond the limits of the 500-year flood event which serve as the contractual limits of lateral migration. Piers 3 and 4 were assessed in compliance with the project Technical Requirements Section 2.30.5.2.

Without Lateral Migration

Scour without lateral migration includes the pier scour calculations performed with local hydraulic conditions upstream of each pier. The scour depth reported is a result of offsetting the profile within the 500-year flow extents by the 1.8 feet of LTD, then the pier scour is applied below where the offset profile intersects the pier centerline. This approach is consistent with WSDOT Bridge Design Manual Figure 7.1.7-1 (see **Figure 1**). The scour depth is from the local ground elevation at the pier down to the bottom of the scour hole. An example of this scoured cross section for Pier 4 is provided in **Figure 2**.

The local ground elevation in the table was selected as the intersection between the ground elevation and the pier centerline. The AECOM structural team has confirmed the existing ground elevations reported in **Table 1** are consistent with their design files.

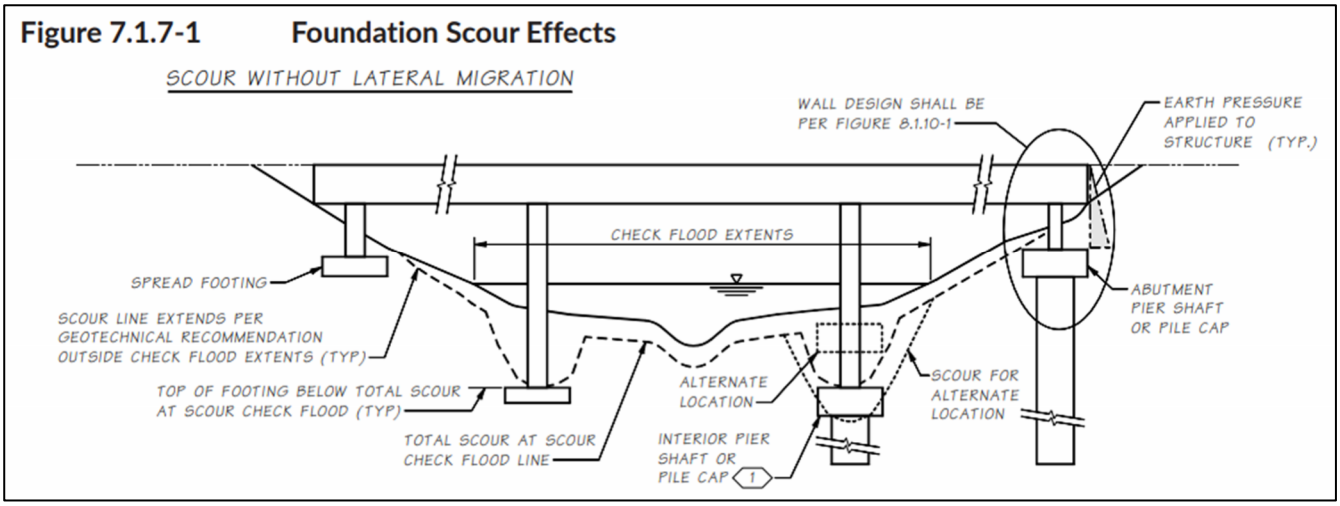

Figure 1 - BDM Figure 7.1.7-1

Table 1 – DRAFT Scour Results (No Lateral Migration)

Scour Data Table - No Lateral Migration

Support No.	Existing Ground Elevation at pier (ft)	Existing Thatlweg Elevation (ft)	Scour Elevation (ft)			Total Scour Depth (ft)		
			100 year	500 year	2080 100-year	100y	500y	2080 100-year
Abutment 1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pier 2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pier 3	28.0	11.0	24.7	23.5	22.7	3.3	4.5	5.3
Pier 4	26.4	11.0	23.8	23.2	22.4	2.6	3.2	4.0
Pier 5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Abutment 6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: Total scour depth for the case of no lateral migration is applied below the ground elevation at the pier. All elevations are reported in North American Vertical Datum of 1988 (NAVD88).

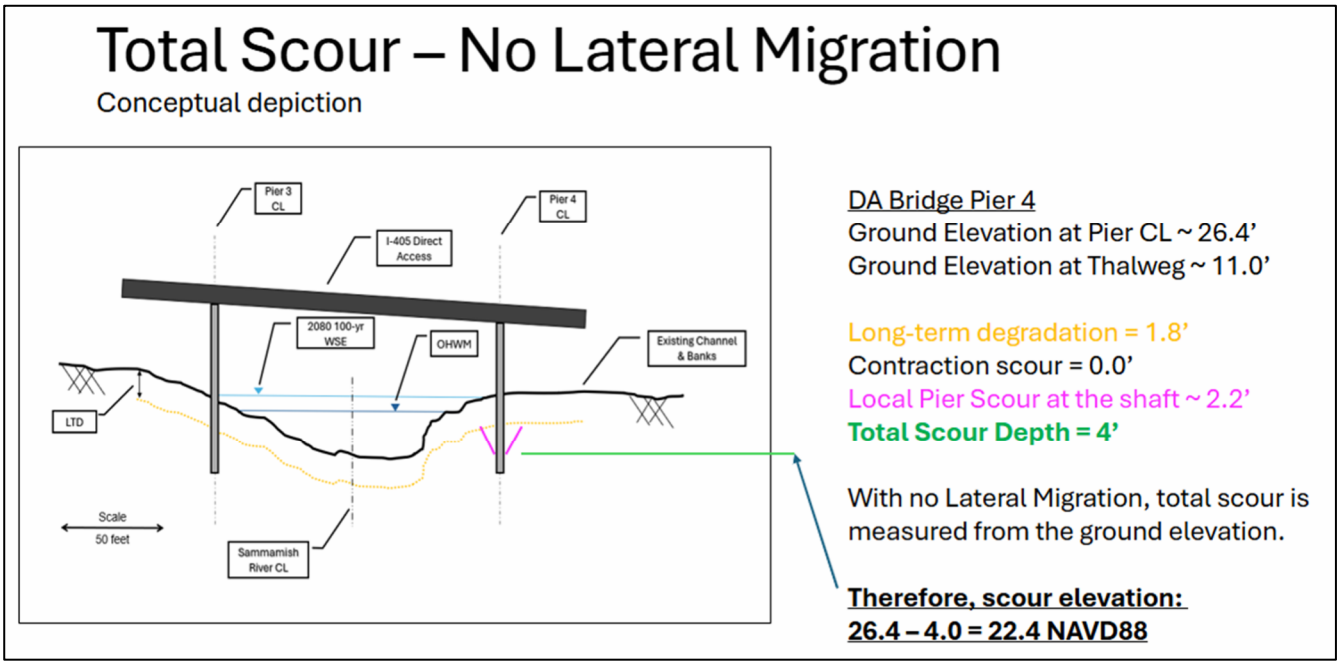

Figure 2 – DRAFT Pier 4 Conceptual Scour Cross Section (2080 100-year)

With Lateral Migration (per WSDOT's IED)

Scour with lateral migration includes pier scour calculations performed with average main channel hydraulic conditions. Results are presented in **Table 2**. The calculated scour depths are relative to the thalweg elevation so should be applied below the thalweg (see **Figure 3**). Several cross-sections were drawn and thalweg elevations in the vicinity of Pier 3 and 4 ranged from 11.4 to 11.6 feet. Based on the range of surveyed cross-sections, a representative thalweg elevation of 11.0 feet was selected.

Definitions of scour results:

Scour Elevation: The elevation of total scour at a bridge pier referenced from NAVD88.

Total Scour Depth: The depth of scour at a bridge pier below the thalweg elevation.

Scour Prism Depth: The depth of scour at a bridge pier below the ground elevation at that pier.

Table 2 – DRAFT Scour Results (With Lateral Migration, per WSDOT's IED)

Scour Data Table - With Lateral Migration

Support No.	Existing Ground Elevation at pier (ft)	Existing Thatlweg Elevation (ft)	Scour Elevation (ft)			Total Scour Depth (ft)			Scour Prism Depth (ft - below ground @ pier)		
			100 year	500 year	2080 100-year	100y	500y	2080 100-year	100y	500y	2080 100-year
Abutment 1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pier 2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pier 3	28.0	11.0	-6.3	-6.4	-6.5	17.3	17.4	17.5	34.3	34.4	34.5
Pier 4	26.4	11.0	-6.3	-6.4	-6.5	17.3	17.4	17.5	32.7	32.8	32.9
Pier 5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Abutment 6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

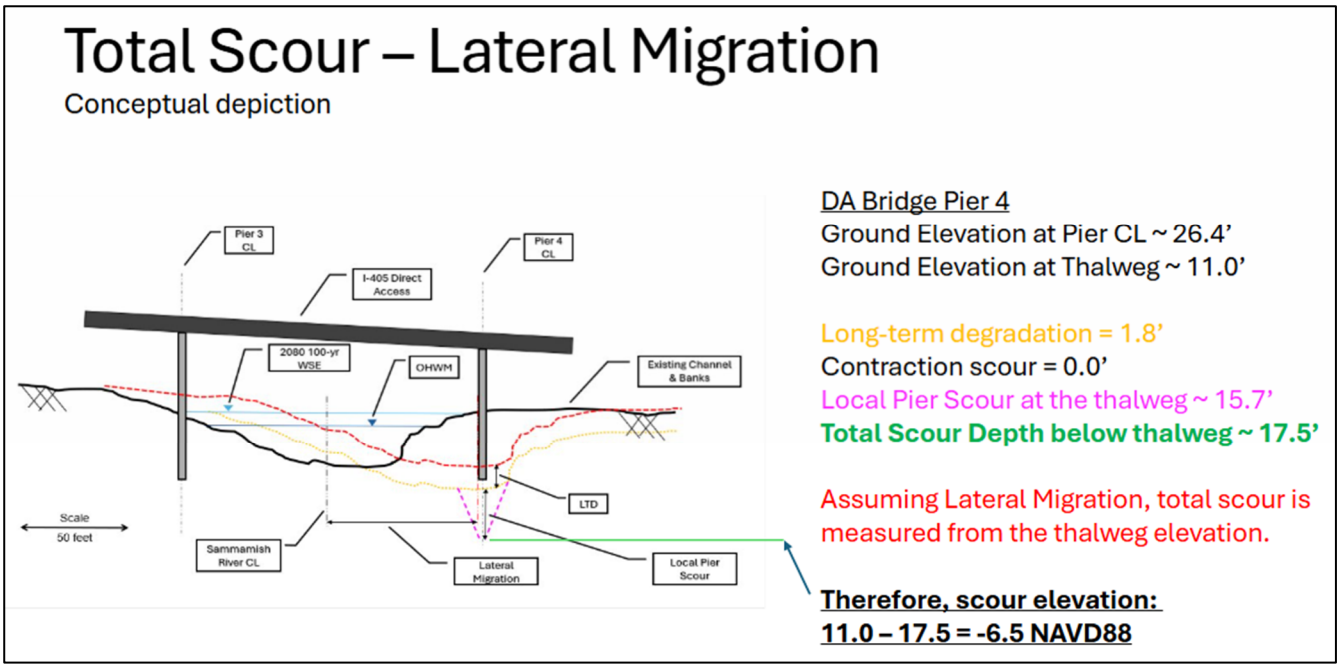

Figure 3 – DRAFT Pier 4 Conceptual Scour Cross Section (2080 100-year)